



# WELDING STUDS

FOR DRAWN ARC STUD WELDING WITH SHIELDING GAS





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## 1. Welding studs for drawn arc stud welding with shielding gas

### 1.1 Technical information

#### Weld pool backing, form of the stud tip

If shielding gas is used for weld pool backing during the stud weld, welding studs without pressed-in aluminium ball at the welding tip are used (see also DIN EN ISO 13918 Welding – Studs and ceramic ferrules for arc stud welding).

Regarding the stud tip two forms have to be distinguished.

#### Tip form 1 (standard acc. to DIN EN ISO 13918):

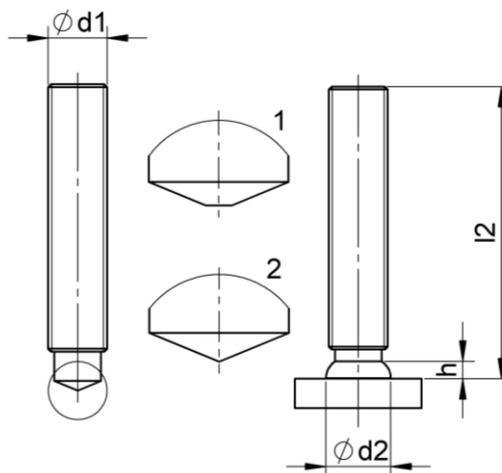
According to DIN EN ISO 13918 the middle part of the stud tip is  $d_2/3$  (for stud types RD, MD, PD, ID) resp.  $d_1/3$  (for stud types FD and UD). This means that the middle part of the stud tip has a small plain area (e.g. 2 mm for M6, 4 mm for M12).

For welding studs with tip form 1 the item number has the ending „-OK-NÜ“.

#### Tip form 2:

Upon customer request (e.g. for positioning on punch marks) we produce studs for which the middle part of the stud tip has no plain area but a sharp point.

For welding studs with tip form 2 the item number has the ending „-OK-SÜ“ or „-OK“.



As an alternative to shielding gas ceramic ferrules can be used for weld pool backing. In this case according to DIN EN ISO 13918 welding studs with pressed-in aluminium ball at the welding tip are used (see catalogue **Welding studs – Drawn arc stud welding with ceramic ferrule**).

#### Materials

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

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

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 fIZnnc-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.

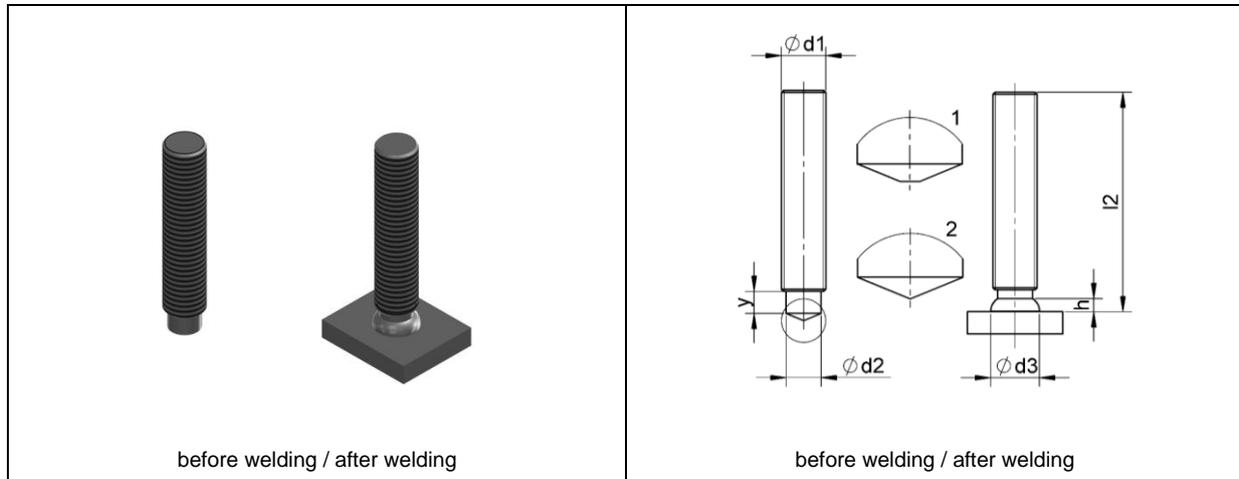
### Weld fillet

During drawn arc stud welding a fillet forms between welding element and base material. The dimensions of the weld fillet are defined by the 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, shielding gas stand) 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 Threaded stud with reduced shaft (type RD acc. to DIN EN ISO 13918)



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)		
d <sub>1</sub>	l <sub>2</sub>	y <sup>1</sup> -0,2P <sup>2</sup>	d <sub>2</sub> -0,1/0,1	d <sub>3</sub> <sup>*</sup>	h <sup>*</sup>	Steel 4.8 <sup>3</sup>	A2-50 <sup>3</sup>	A5-50 <sup>3</sup>
M6	15-100	4	4,7	7	2,5	41-06-XXX-OK-NÜ	42-06-XXX-OK-NÜ	43-06-XXX-OK-NÜ
M8	15-100	4	6,2	9	2,5	41-08-XXX-OK-NÜ	42-08-XXX-OK-NÜ	43-08-XXX-OK-NÜ
M10	15-100	5	7,9	11,5	3	41-10-XXX-OK-NÜ	42-10-XXX-OK-NÜ	43-10-XXX-OK-NÜ
M12	20-100	6	9,5	13,5	4	41-12-XXX-OK-NÜ	42-12-XXX-OK-NÜ	43-12-XXX-OK-NÜ

<sup>1</sup>Other y-dimensions available upon request.

<sup>2</sup>P = thread pitch acc. to DIN 13-1

\*d<sub>3</sub> and h are approximate values.

<sup>3</sup>The ending „OK-NÜ“ refers to studs with tip form 1. If tip form 2 is requested, in the item number „-OK-NÜ“ must be replaced by „-OK-SÜ“ resp. „-OK“ (see explanations on the tip form in chapter 1.1).

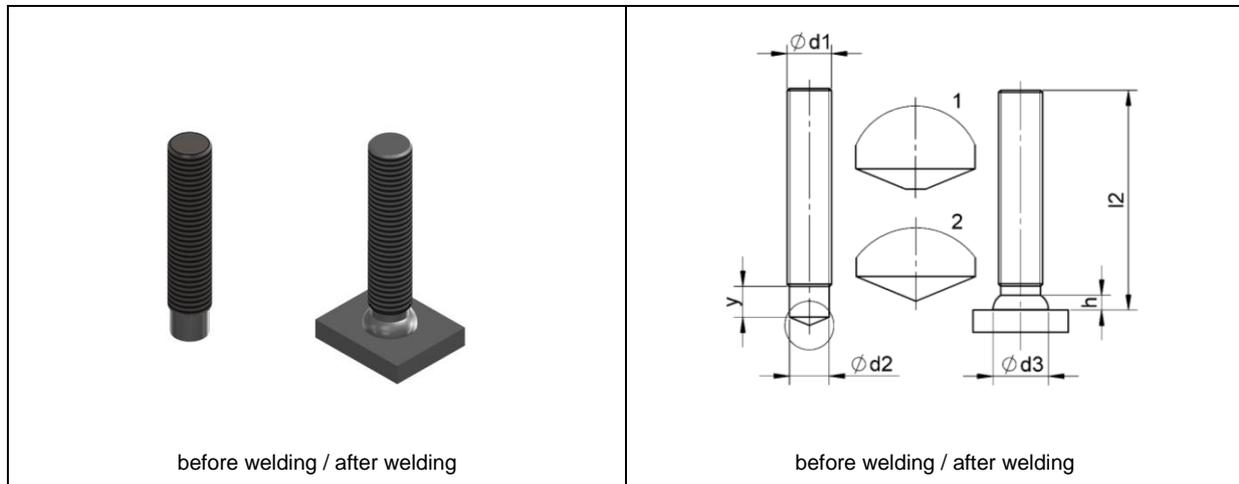
In the item number **XXX** has to be replaced by the respective welding element length l<sub>2</sub> (e.g. 030 for 30 mm).

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.**

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



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 identical 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)		
$d_1$	$l_2$	$y$ -0/+0,5	$d_2$ -0,1/0,1	$d_3^*$	$h^*$	Steel 4.8 <sup>1</sup>	A2-50 <sup>1</sup>	A5-50 <sup>1</sup>
M6	15-100	5,5	5,3	8,5	4	46-06-XXX-MPF-OK-NÜ	47-06-XXX-MPF-OK-NÜ	48-06-XXX-MPF-OK-NÜ
M8	15-100	6	7,1	10	3	46-08-XXX-MPF-OK-NÜ	47-08-XXX-MPF-OK-NÜ	48-08-XXX-MPF-OK-NÜ
M10	15-100	6,5	8,95	12,5	3,4	46-10-XXX-MPF-OK-NÜ	47-10-XXX-MPF-OK-NÜ	48-10-XXX-MPF-OK-NÜ
M12	20-100	7,5	10,8	14,5	4,2	46-12-XXX-MPF-OK-NÜ	47-12-XXX-MPF-OK-NÜ	48-12-XXX-MPF-OK-NÜ

\* $d_3$  and  $h$  are approximate values.

<sup>1</sup>The ending „OK-NÜ“ refers to studs with tip form 1. If tip form 2 is requested, in the item number „-OK-NÜ“ must be replaced by „-OK-SÜ“ resp. „-OK“ (see explanations on the tip form in chapter 1.1).

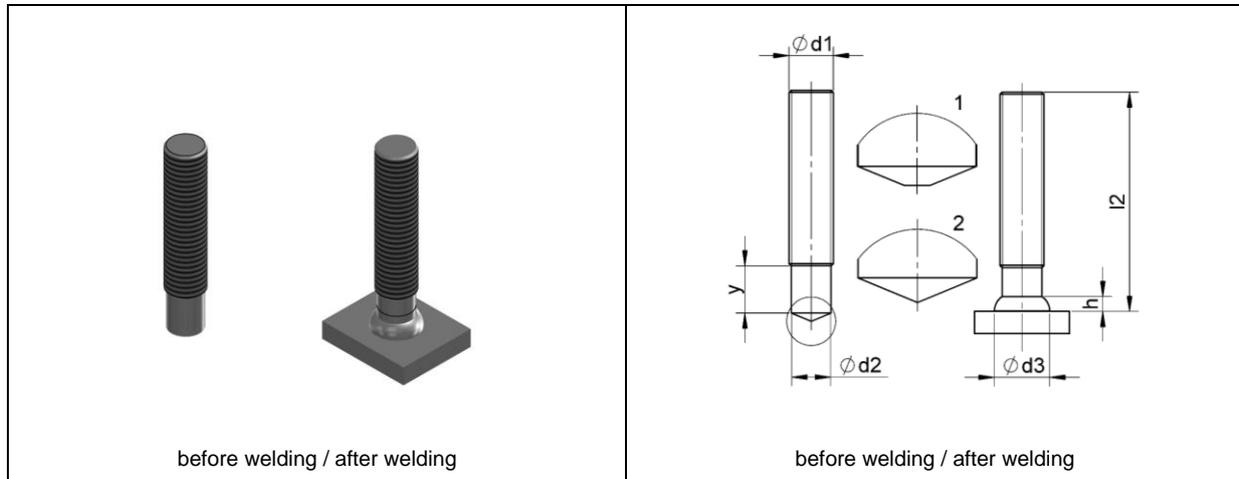
In the item number **XXX** has to be replaced by the respective welding element length  $l_2$  (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 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 partial thread (type PD acc. to DIN EN ISO 13918)



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)		
$d_1$	$l_2$	$y$ -0/2P <sup>1</sup>	$b$	$d_2$ -0,1/0,1	$d_3^*$	$h^*$	Steel 4.8 <sup>2</sup>	A2-50 <sup>2</sup>	A5-50 <sup>2</sup>
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-OK-NÜ	47-06-XXX-OK-NÜ	48-06-XXX-OK-NÜ
M8	20 ≤ $l_2$ < 50 50 ≤ $l_2$ < 160 $l_2$ ≥ 160	9 - -	- 40 40	7,1	10	3,5	46-08-XXX-OK-NÜ	47-08-XXX-OK-NÜ	48-08-XXX-OK-NÜ
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-OK-NÜ	47-10-XXX-OK-NÜ	48-10-XXX-OK-NÜ
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-OK-NÜ	47-12-XXX-OK-NÜ	48-12-XXX-OK-NÜ

<sup>1</sup>P = thread pitch acc. to DIN 13-1

\* $d_3$  and  $h$  are approximate values.

<sup>2</sup>The ending „OK-NÜ“ refers to studs with tip form 1. If tip form 2 is requested, in the item number „-OK-NÜ“ must be replaced by „-OK-SÜ“ resp. „-OK“ (see explanations on the tip form in chapter 1.1).

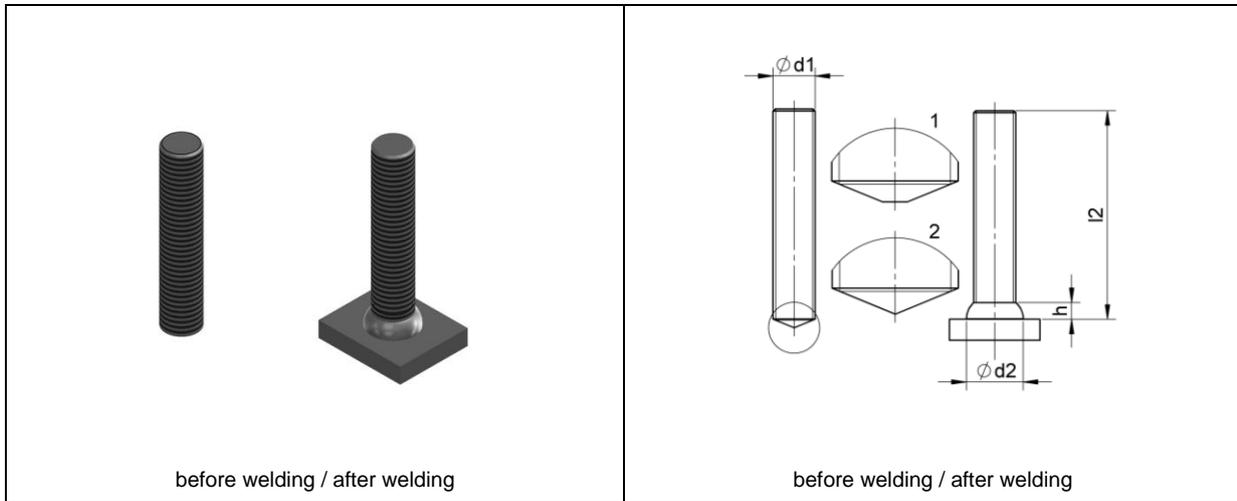
In the item number **XXX** has to be replaced by the respective welding element length  $l_2$  (e.g. 030 for 30 mm).

Explanations to the used materials can be found in chapter 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 full thread (type FD acc. to DIN EN ISO 13918)



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)		
$d_1$	$l_2$	$d_3^*$	$h^*$	Steel 4.8 <sup>1</sup>	A2-50 <sup>1</sup>	A5-50 <sup>1</sup>
M6	15-100	8,5	4	44-06-XXX-OK-NÜ	54-06-XXX-OK-NÜ	54-1-06-XXX-OK-NÜ
M8	15-100	11	4	44-08-XXX-OK-NÜ	54-08-XXX-OK-NÜ	54-1-08-XXX-OK-NÜ
M10	15-100	13	4	44-10-XXX-OK-NÜ	54-10-XXX-OK-NÜ	54-1-10-XXX-OK-NÜ
M12	20-100	16	5	44-12-XXX-OK-NÜ	54-12-XXX-OK-NÜ	54-1-12-XXX-OK-NÜ

\* $d_3$  and  $h$  are approximate values.

<sup>1</sup>The ending „OK-NÜ“ refers to studs with tip form 1. If tip form 2 is requested, in the item number „-OK-NÜ“ must be replaced by „-OK-SÜ“ resp. „-OK“ (see explanations on the tip form in chapter 1.1).

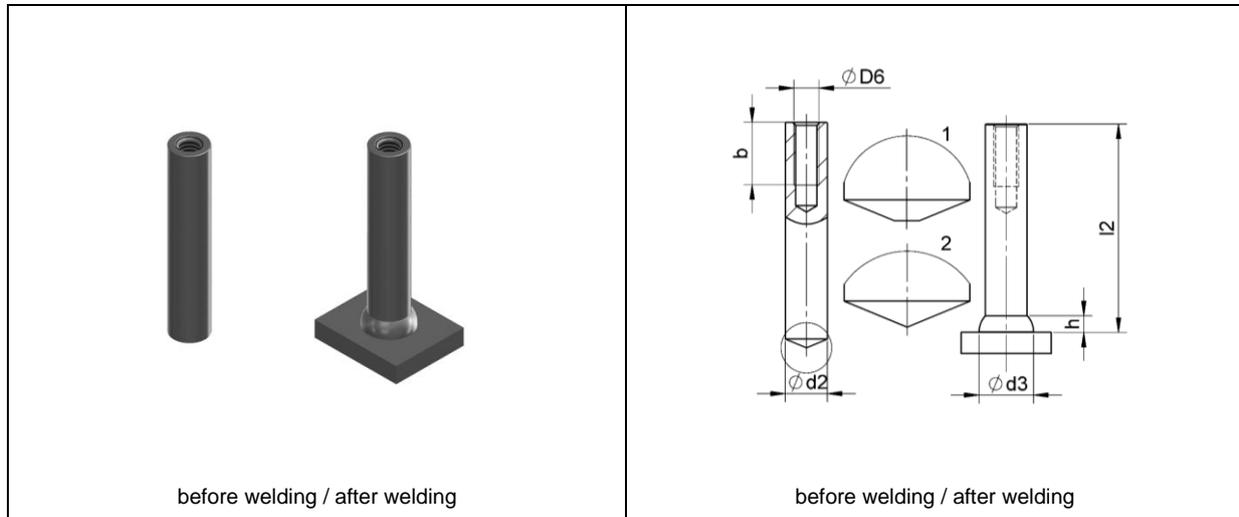
In the item number **XXX** has to be replaced by the respective welding element length  $l_2$  (e.g. 030 for 30 mm).

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

Available surface treatments can be found in chapter 1.1.

**Not listed dimensions and materials available upon request.**

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



Dimensions						Material (item number)		
D <sub>6</sub>	b +2P <sup>1</sup>	d <sub>2</sub> -0,1/0,1	l <sub>2</sub>	d <sub>3</sub> *	h*	Steel 4.8 <sup>2</sup>	A2-50 <sup>2</sup>	A5-50 <sup>2</sup>
M5	7	10	15-100	13	4	61-10-XXX-M5X7-OK-NÜ	62-10-XXX-M5X7-OK-NÜ	62-3-10-XXX-M5X7-OK-NÜ
M6	9 (7 <sup>3</sup> )	10	15-100	13	4	61-10-XXX-M6X7-OK-NÜ <sup>3</sup> 61-10-XXX-M6X9-OK-NÜ	62-10-XXX-M6X7-OK-NÜ <sup>3</sup> 62-10-XXX-M6X9-OK-NÜ	62-3-10-XXX-M6X7-OK-NÜ <sup>3</sup> 62-3-10-XXX-M6X9-OK-NÜ
M8	12 (8 <sup>3</sup> )	12	15-100	16	5	61-12-XXX-M8X8-OK-NÜ <sup>3</sup> 61-12-XXX-M8X12-OK-NÜ	62-12-XXX-M8X8-OK-NÜ <sup>3</sup> 62-12-XXX-M8X12-OK-NÜ	62-3-12-XXX-M8X8-OK-NÜ <sup>3</sup> 62-3-12-XXX-M8X12-OK-NÜ

<sup>1</sup>P = thread pitch acc. to DIN 13-1

<sup>3</sup>for l<sub>2</sub> < 20 mm

\*d<sub>3</sub> and h are approximate values.

<sup>2</sup>The ending „OK-NÜ“ refers to studs with tip form 1. If tip form 2 is requested, in the item number „-OK-NÜ“ must be replaced by „-OK-SÜ“ resp. „-OK“ (see explanations on the tip form in chapter 1.1).

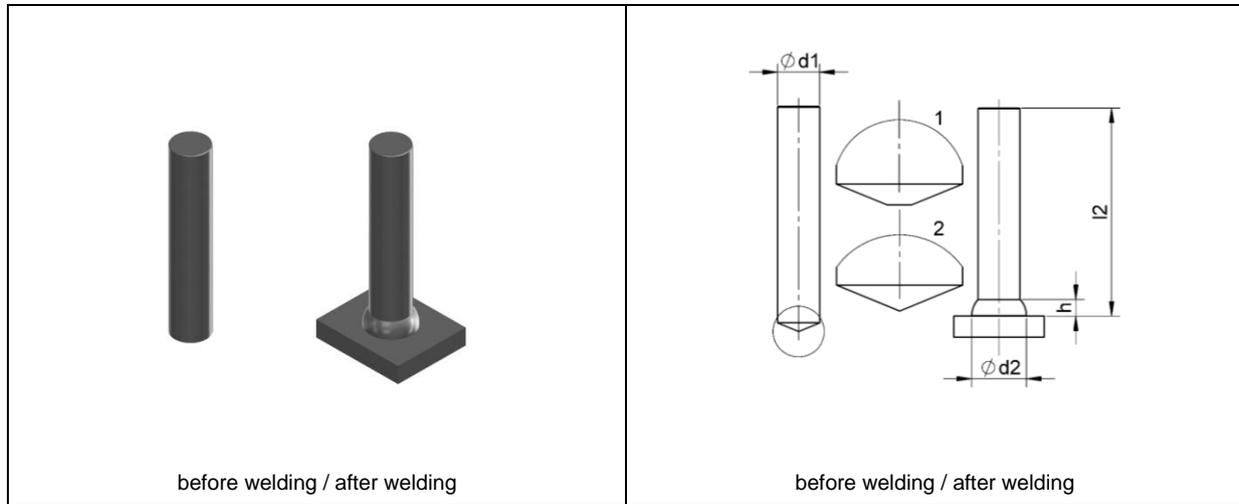
In the item number XXX has to be replaced by the respective welding element length l<sub>2</sub> (e.g. 030 for 30 mm).

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



Dimensions				Material (item number)		
$d_1$ -0,1/0,1	$l_2$	$d_2^*$	$h^*$	Steel 4.8 <sup>1</sup>	A2-50 <sup>1</sup>	A5-50 <sup>1</sup>
6	15-100	8,5	4	56-06-XXX-OK-NÜ	57-06-XXX-OK-NÜ	58-06-XXX-OK-NÜ
8	15-100	11	4	56-08-XXX-OK-NÜ	57-08-XXX-OK-NÜ	58-08-XXX-OK-NÜ
10	15-100	13	4	56-10-XXX-OK-NÜ	57-10-XXX-OK-NÜ	58-10-XXX-OK-NÜ
12	15-100	16	5	56-12-XXX-OK-NÜ	57-12-XXX-OK-NÜ	58-12-XXX-OK-NÜ

\* $d_2$  and  $h$  are approximate values.

<sup>1</sup>The ending „OK-NÜ“ refers to studs with tip form 1. If tip form 2 is requested, in the item number „-OK-NÜ“ must be replaced by „-OK-SÜ“ resp. „-OK“ (see explanations on the tip form in chapter 1.1).

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 1.1.

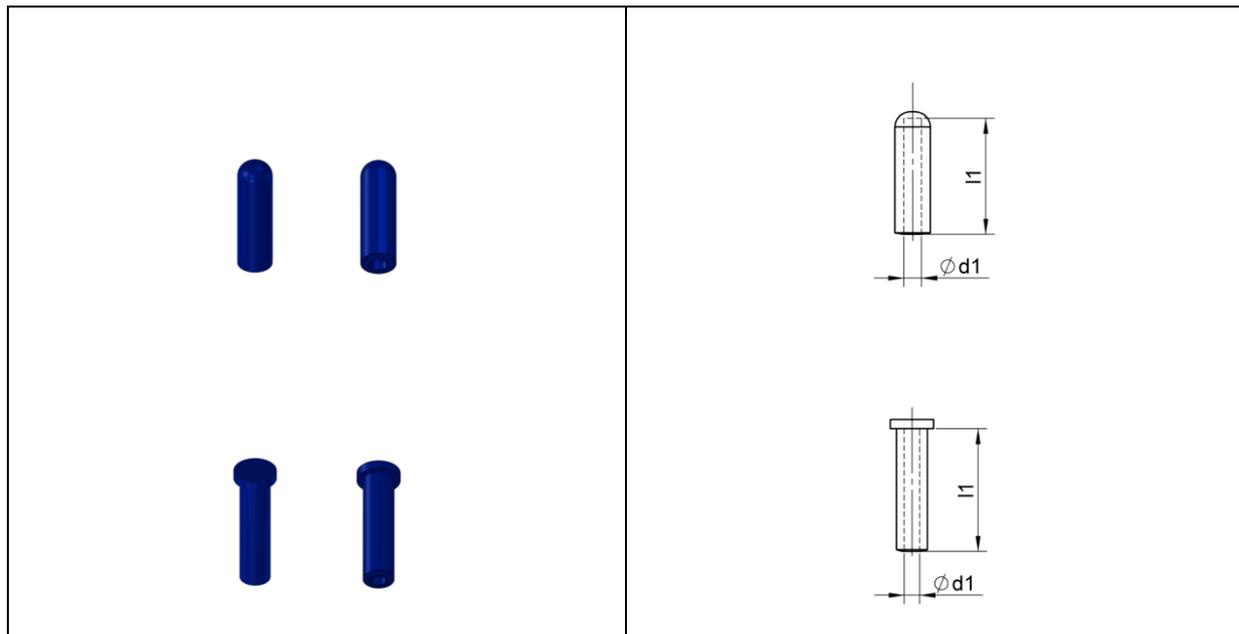
Available surface treatments can be found in chapter 1.1.

**Not listed dimensions and materials available upon request.**

## 1.8 Silicone cover caps

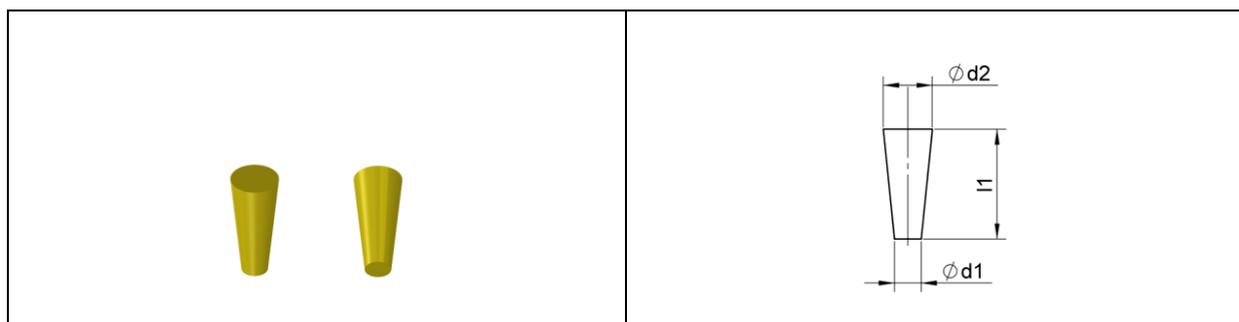
Silicone cover caps protect the mechanical important areas of the welding elements during painting and powder coating as well as during the burning-in process (permanent temperature  $\leq 210^{\circ}\text{C}$ , short temperature  $\leq 300^{\circ}\text{C}$ ).

### 1.8.1 Silicone cover caps for threaded studs and non-threaded studs



Available dimensions upon request.

### 1.8.2 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 Threaded stud (type RD, MD, PD, FD), internally threaded stud (type ID), non-threaded stud (type UD)**

Stud dimensions		Gun accessories	
d <sub>1</sub>	l <sub>2</sub>	Chuck (item number)	Stand shielding gas (gun type: item number)
M6	l <sub>2</sub> ≤ 12	83-04-006	PHM-12, GD 12/15: B-90-50-1035
	l <sub>2</sub> > 12	83-07-006	PHM-160/161, GD 16/19/22/25: B-90-50-1007
M8	l <sub>2</sub> ≤ 15	83-04-008	PHM-12, GD 12/15: B-90-50-1035
	l <sub>2</sub> > 15	83-09-008	PHM-160/161, GD 16/19/22/25: B-90-50-1007
M10	l <sub>2</sub> ≤ 15	83-04-010	PHM-12, GD 12/15: B-90-50-1035
	l <sub>2</sub> > 15	83-11-010	PHM-160/161, GD 16/19/22/25: B-90-50-1007
M12	l <sub>2</sub> ≤ 20	83-04-012	PHM-12, GD 12/15: B-90-50-1035
	l <sub>2</sub> > 20	83-13-012	PHM-160/161, GD 16/19/22/25: B-90-50-1007





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