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Quality meets Innovation

Welding Elements Catalogue

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Welding Elements

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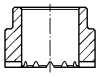
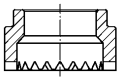
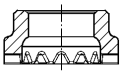
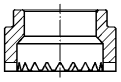
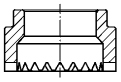
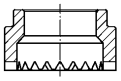
Welding elements Catalogue Issue 2019-03

(The current PDF version of our catalogue can be found on www.hbs-info.com .)

Table of Contents

Welding technique	Type of stud [1]	Symbol for stud	Symbol for ceramic ferrule
Stud welding with tip ignition - CD	Threaded stud (pitch)	 PT	—
	Unthreaded stud (pin)	 UT	—
	Stud with internal thread	 IT	—
	Ground clip single style [2]	 F1	—
	Ground clip double style [2]	 F2	—
Drawn arc stud welding with ceramic ferrule or shielding gas - ARC	Threaded stud with reduced shaft	 RD	 RF
	Virtually fully-threaded stud	 MD (DD)	 MF (UF)
	Partially threaded stud (pitch)	 PD	 PF
	Unthreaded stud (pin)	 UD	 UF
	Stud with internal thread	 ID	 UF
	Shear connector	 SD	 UF/DF
Short cycle drawn arc stud welding - SC	Threaded stud with flange (pitch)	 PS	—
	Unthreaded stud (pin) with flange	 US	—
	Stud with internal thread and flange	 IS	—

[1] Further types of stud and ceramic ferrules can be specified as required for special applications.

[2] At the manufacturer's discretion.

Dimensions:
The dimensions of our welding elements can be found in the respective dimension tables of the catalogue (all dimensions in mm).
Non-standard welding elements are delivered in compliance with DIN EN ISO 13918.
Nominal dimensions for the welding elements are listed in the tables. Deviations in the outer form or in the dimensions are permissible provided the welding range corresponds to the specifications in the table. The rated value is the length after welding l_2. Details that are not defined are left to the manufacturer.
On request, we will deliver special welding elements or custom-made drawing parts, which are not described.

Surface defects / damages to threads
During thread production, small overlaps and/or profile deviations can occur – during the further production processes (coating, transport), minor damages such as dents, nicks and impact marks that impede the free movement in threaded gauges and in mating threads are unavoidable. These production-related surface defects / damages are permissible within certain limits according to ISO 6157-1/-3.

Stainless CrNi steels / austenitic materials
Austenitic materials cannot be hardened using heat-treatment measures. The mounting characteristics of connecting elements made from these materials are therefore different than those of comparable steel screws. Improper mounting (of the nuts) can lead to failure (cold welding / seizing / breakage).
The magnetic properties are described by the permeability. Connecting elements made of austenitic CrNi steels are not generally magnetisable. After production (cold-forming processes), there may be a certain degree of magnetisability.

Quality level
HBS welding studs are supplied according to DIN EN ISO 3269 with quality level (AQL) 1.5.
Product testing and evaluation of the welding elements is based on the recommendations of DIN EN ISO 13918 for factory production control (FPC).

Acceptance inspection (AQL)
Because deliveries without isolated defects or defective parts cannot be presumed for standardised parts manufactured in mass production for general applications due to economic reasons, the expectation of “0-error” deliveries is, in principle, not consistent with standards (ISO 3269).
For production and the inspection of goods, ISO 13918 provides values for random sample tests within the framework of the German Chamber of Public Accountants (WPK).

Directives and laws

- HBS welding elements in accordance with DIN EN ISO 13918 or similar are inspected with respect to the limitation and utilization of specific dangerous substances in accordance with the following EU directives and comply with these directives:
- 2011/65/EU as well as 2015/863/EU (RoHS) or German Ordinance on Hazardous Substances in Electrical and Electronic Equipment (ElektroStoffV)
- 1907/2006 (REACh / SVHC free)
- 2010/1502 (free of conflict minerals/Dodd-Frank Act).

RoHS
The RoHS conformity of stainless steels is generally associated with the question of hexavalent chromium. The fact that this is not present in stainless steels due to thermodynamic reasons is explained on, among other places, the www.edelstahl-rostfrei.de website under the heading “Werkstoffe /FAQ” (Materials). Thus, stainless steel is RoHS compliant and, in this regard, is to be classified as harmless.

EU Directive 1907/2006 – REACh Chemicals Regulation
As a manufacturer of products (non-chemical products), the company HBS is a “downstream user” in the spirit of REACh. As a downstream user, HBS has, in principle, no registration requirements under REACh.
The welding elements that you purchase from us are, thus, not subject to registration as products in the spirit of REACh. The materials that may be subject to registration present in our products must, thus, only be registered by our sub-suppliers. As a downstream user, we conduct the necessary communication with our sub-suppliers.
Acc. to Article 3 of REACh, connecting elements are so-called articles. Articles are objects whose function is not determined by the effect of substances, but rather by their outer form. According to Article 7, Paragraph 1 of REACh, articles are subject to registration if they contain chemicals that are intended to be released. This is, however, not the case for connecting elements / welding elements according to DIN EN ISO 13918.

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Excess/minor deliveries
With respect to articles made as per sample or drawing and requiring special manufacture production-related excess/short deliveries of up to 10 % have to be accepted as delivery according to contract. Exceptions need to be noted explicitly in the order and to be confirmed in writing.

Tolerances
As long as no tolerances are specified for dimensions, form and position HBS welding studs are supplied according to DIN EN ISO 4759-1, product class A.

Nominal dimensions for the welding elements are listed in the tables. Deviations in the outer form or in the dimensions are permissible provided the welding range corresponds to the specifications in the table. The rated value is the length after welding l_2. Details that are not defined are left to the manufacturer.

Storage
We recommend to store the welding studs factory-packed. That‘s how you can avoid irregular welding results caused by humidity (oxidation), dirt etc.
With aluminium welding studs, the thickness of the oxide layer of the surface can be reduced to a minimum value using the recommended storage procedure.
Due to its corrosion properties, we recommend quick processing.
Please avoid mixing different batches.

Ordering
You make order processing a lot easier if you indicate the order numbers which are part of the price lists.

1

Welding process:

Capacitor discharge stud welding with tip ignition (CD)

Welding elements type PT
Threaded studs

Name for a metric threaded stud according to DIN EN ISO 13918.

4.8 copper coated
from page 12

A2-50
from page 13

CuZn37
from page 14

AlMg3
from page 15

Welding elements type UT
Unthreaded studs (pins)

Name for a pin according to DIN EN ISO 13918.

4.8 copper coated
from page 16

A2-50
from page 16

CuZn37
from page 16

AlMg3
from page 16

Welding elements type IT
Studs with internal thread

Name for a stud with internal thread according to DIN EN ISO 13918.

4.8 copper coated
from page 15

A2-50
from page 16

AlMg3
from page 19

CD Paint clearing threaded studs

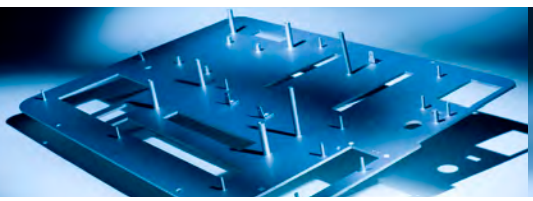
Name for a metric threaded stud with longitudinal grooves.

The welding geometry is designed similar to DIN EN ISO 13918.

Especially suitable for subsequent painting/coating.

4.8 copper coated
from page 18

CuZn37
from page 19



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Welding process:

Capacitor discharge stud welding with tip ignition (CD)

CD Fir tree studs

Name for a threaded stud, also referred to as a saw tooth stud or coarse threaded stud. Fir tree studs have a special thread with a defined pitch (P) of 1.6 mm.

The welding geometry is designed similar to DIN EN ISO 13918.

Especially suitable for the quick installation of snap-on elements such as plastic nuts or cable mountings.

4.8 copper coated
from page 22

A2-50
from page 22

Ground clips, single style (F1) and double style (F2)

Ground clips are also referred to as earthing connections.

The welding geometry is designed similar to DIN EN ISO 13918.

4.8 copper coated
from page 23

A2-50
from page 23

CuZn37
from page 23

AlMg3
from page 23

Silicone caps

Silicone caps protect the mechanically important areas of welding elements during painting and powder coating as well as during the baking process.

from page 24

1

Stud types, abbreviations, material, norm, mechanical characteristics according to DIN EN ISO 13918

Stud types		Abbreviations for studs	Material	Norm	Mechanical characteristics: tensile strength R_m 0,2 % yield strength $R_{p0,2}$
Stud welding with capacitor discharge (TS)	Threaded stud	PT	Steel 4.8[1] copper coated (C1E - ISO 4042)	ISO 898-1	$R_m \geq 420$ N/mm²
			A2-50 A2-70, A4-50, A4-70, A5-50, A5-70	ISO 3506-1	$R_m \geq 500$ N/mm² $R_{p0,2} \geq 210$ N/mm²
	Unthreaded stud (Pin)	UT	CuZn37	EN 12166	$R_m \geq 370$ N/mm²
	Stud with internal thread	IT	EN AW-AlMg3 EN AW-5754	EN 1301-2	$R_m \geq 230$ N/mm²
			EN AW-Al99,5 EN AW-1050A[2]	EN 573-3	$R_m \geq 100$ N/mm²

Further material upon request

[1] suitable for welding
[2] on request

Mounting tightening torque

Threaded stud	Steel 4.8[1] $R_{p0.2}$ = 340 N/mm²	A2-50 $R_{p0.2}$ = 210 N/mm²	AlMg3 F23 $R_{p0.2}$ = 170 N/mm²
	Mounting tightening torques (Nm)		
M3	0.5	0.3	0.2
M4	1.2	0.7	0.6
M5	2.2	1.4	1.1
M6	4.0	2.5	2.0
M8	9.5	6.0	4.7
M10	18.5	12.0	9.5
Torques in compliance with the following conditions: 1) $F_{Mperm}(\mu_{tot,5\,\%}) \geq F(\mu_{tot,5\,\%})$ 2) $F(\mu_{tot,95\,\%}) \geq 0{,}25\ R_{p0.2}A_S$			

Values correspond with DVS leaflet 0904

[1] suitable for welding

All specified values are reference points for mounting tightening torques without lasting deformation of the joined parts. Prerequisite is that the jointed part have sufficient wall thickness. The values apply for cold-rolled threaded studs with standard thread without surface protection and without thread lubrication. At least the stress cross-section must be present over the entire stud length. The values apply for the specified yield strengths.

Recommendations for mounting tightening torques for common stud diameters and materials are provided in leaflet DVS 0904. The specified tightening torques ensure that the permissible mounting pretensioning force F_{Mperm} acc. to VDI directive 2230, Sheet 1, is not exceeded and plastic deformations in the connection are thereby avoided. Furthermore, under static loading, loosening of the nut should be prevented by achieving a pretensioning force of at least 25 % of the 0.2 % yield strength. In the event of deviation from the specified basic conditions, the required tightening parameters are to be determined on the basis of a process inspection.

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Material combinations

according to DIN EN ISO 14555
(Select stud material in a way that material of the same kind is welded)

Stud material	base material				
	ISO/TR 15608 Groups 1 to 6, 11.1	ISO/TR 15608 groups 1 to 6, 11.1 and galvanized and metal plated steel sheets, max. coating thickness 25 µm	ISO/TR 15608 Groups 8	Copper and unleaded copper alloys, e.g. CuZn37 (CW508L)	ISO/TR 15608 Groups 21 and 22
Steel 4.8[1)]	a	b	a	b	--
A2-50	a	b	a	b	--
CuZn37	b	b	b	a	--
EN AW-Al99.5	--	--	--	--	b
EN AW-AlMg3	--	--	--	--	a
Exemplification of welding suitability: -- non weldable a well suited for any application, e. g. power transmission b suitable, limitations with power transmission					

Weldability tests of other material combinations upon request.

[1)] suitable for welding

Stud Flange
The stud flange is designed according to DIN EN ISO 13918. The flange is part of the welding stud. Its diameter is bigger than the diameter of the stud. During welding, it prevents the arc from burning to the cylindrical part of the stud and increases the welding area simultaneously. This results in higher strength of the welded joint. The flange also serves to automatic feeding using HBS stud feeding units. Depending on requirements, you can use welding studs which have different flange dimensions or even no flange.

Threads
Non coated threaded studs are provided with a thread to DIN ISO 724, DIN EN ISO 4759-1, product class A, tolerance zone 6g. Thread run-in and run-out are decisions of the manufacturer.
Galvanized threaded studs correspond with DIN EN ISO 4042, tolerance zone 6h.

Cold rolling of thread shows the following advantages:
- no interruption of fiber orientation,
- increase of strength by up to 200 %,
- decrease of surface roughness in connection with
- increased corrosion resistance.

Surface Treatment
Studs, pins, and studs with internal thread (PT, UT, IT) made of steel (4.8) are normally protected against corrosion through a galvanized copper coating (C1E). Layer thickness is between 3 and 5 µm.

Welding elements with particular specifications available on request

Order key for welding elements

00-00-000
- 000 Length
- 00 Outer Ø
- 00 Internal Ø (Thread)
- 00 Material
- 00 Stud type

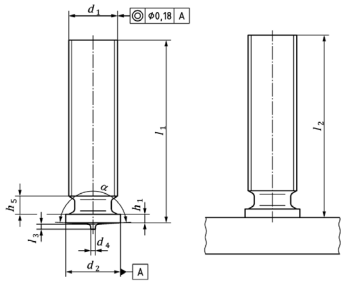
Stud type	
1	Threaded stud
2	Pin
3	Stud with internal thread, grounding clip, silicon cover

Material	
1	Steel 4.8 copper coated (C1E)
2	1.4301/03 (A2-50)
3	CuZn37
4	AlMg3 (EN AW AlMg3/EN AW 5754)

Order examples:
Threaded stud M4 x 20, material steel 4.8 copper coated — **Order No.** 11-04-020
Stud with internal thread Ø 5 x 12 M3, material (A2-50) — **Order No.** 32-35-012

	Type	Material	Suitable for stud feeding	
			Manual	Automation[1]
	PT Threaded studs	Steel 4.8 copper coated (suitable for welding)	e.g. 	e.g. 

d_1	l_1 +0.6	d_2 ±0.2	d_4 ±0.08	l_3 ±0.05	max. h_5	h_1	α ±2°
M3	see table	4.50	0.60	0.55	0.60	0.70 - 1.40	174°
M4		5.50	0.65				
M5		6.50	0.75	0.80	1.00		
M6		7.50					
M8		9.00		0.85	1.50	0.80 - 1.40	
M10[2]		10.70	0.80			1.20 - 1.80	



Diameter →

Length l_1	M3 Order No.	M4 Order No.	M5 Order No.	M6 Order No.	M8 Order No.	M10 Order No.
6 mm	11-03-006	11-04-006	--	--	--	--
8 mm	11-03-008	11-04-008	11-05-008	11-06-008	--	--
10 mm	11-03-010	11-04-010	11-05-010	11-06-010	11-08-010	--
12 mm	11-03-012	11-04-012	11-05-012	11-06-012	11-08-012	--
15 mm	11-03-015	11-04-015	11-05-015	11-06-015	11-08-015	--
16 mm	11-03-016	11-04-016	11-05-016	11-06-016	11-08-016	--
20 mm	11-03-020	11-04-020	11-05-020	11-06-020	11-08-020	11-10-020*
25 mm	11-03-025	11-04-025	11-05-025	11-06-025	11-08-025	11-10-025*
30 mm	11-03-030	11-04-030	11-05-030	11-06-030	11-08-030	11-10-030*
35 mm	--	11-04-035	11-05-035	11-06-035	11-08-035	--
40 mm	--	11-04-040	11-05-040	11-06-040	11-08-040	11-10-040*
45 mm	--	--	--	11-06-045	11-08-045	--
Chuck	82-50-003	82-50-004	82-50-005	82-50-006	82-50-008	82-50-009
						 (Distance ring 92-40-010 or leg assembly 92-40-043 neccessary)
Chuck	84-50-003	84-50-004	84-50-005	84-50-006	84-50-008	--
						

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: M3 to M8 (M10 with modification only)
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

2) Similar to DIN EN ISO 13918

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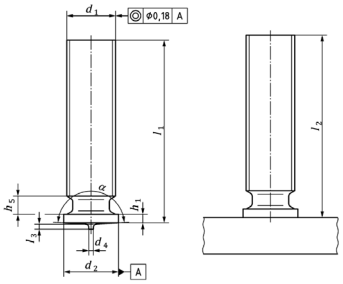
	Type	Material	Suitable for stud feeding	
			Manual	Automation[1]
	PT Threaded studs	A2-50	e.g. 	e.g. 

d_1	l_1 +0.6	d_2 ±0.2	d_4 ±0.08	l_3 ±0.05	max. h_5	h_1	α ±2°
M3	see table	4.50	0.60	0.55	0.60	0.70 - 1.40	174°
M4		5.50	0.65				
M5		6.50	0.75	0.80	1.00		
M6		7.50					
M8		9.00		0.85	1.50	0.80 - 1.40	
M10[2]		10.70	0.80			1.20 - 1.80	



Diameter →

Length l_1 ↓	M3	M4	M5	M6	M8	M10
	Order No.	Order No.	Order No.	Order No.	Order No.	Order No.
6 mm	12-03-006	12-04-006	--	--	--	--
8 mm	12-03-008	12-04-008	12-05-008	12-06-008	--	--
10 mm	12-03-010	12-04-010	12-05-010	12-06-010	12-08-010	--
12 mm	12-03-012	12-04-012	12-05-012	12-06-012	12-08-012	--
15 mm	12-03-015	12-04-015	12-05-015	12-06-015	12-08-015	--
16 mm	12-03-016	12-04-016	12-05-016	12-06-016	12-08-016	--
20 mm	12-03-020	12-04-020	12-05-020	12-06-020	12-08-020	12-10-020*
25 mm	12-03-025	12-04-025	12-05-025	12-06-025	12-08-025	12-10-025*
30 mm	12-03-030	12-04-030	12-05-030	12-06-030	12-08-030	12-10-030*
35 mm	12-03-035	12-04-035	12-05-035	12-06-035	12-08-035	12-10-035*
40 mm	--	12-04-040	12-05-040	12-06-040	12-08-040	12-10-040*
45 mm	--	12-04-045	--	12-06-045	12-08-045	--
50 mm	--	--	--	12-06-050	12-08-050	12-10-050*
55 mm	--	--	--	12-06-055	12-08-055	--
Chuck	82-50-003	82-50-004	82-50-005	82-50-006	82-50-008	82-50-009
						 (Distance ring 92-40-010 or leg assembly 92-40-043 neccessary)
Chuck	84-50-003	84-50-004	84-50-005	84-50-006	84-50-008	--
						

Further accessories see accessories catalogue

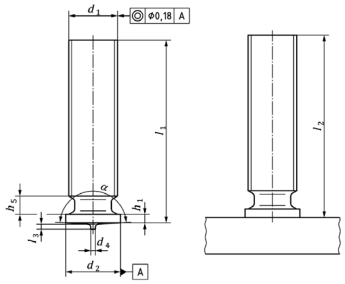
* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: M3 to M8 (M10 with modification only)
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

2) Similar to DIN EN ISO 13918

	Type	Material	Suitable for stud feeding	
			Manual	Automation[1]
	PT Threaded studs	CuZn37 (CW 508L)[3]	e.g. 	e.g. 

d_1	l_1 +0.6	d_2 ±0.2	d_4 ±0.08	l_3 ±0.05	max. h_5	h_1	α ±2°	
M3	see table	4.50	0.60	0.55	0.60	0.70 - 1.40	174°	
M4		5.50	0.65					
M5		6.50	0.75	0.80	1.00			
M6		7.50						
M8[3]		9.00		0.85	1.50	0.80 - 1.40		
M10[2][3]		10.70	0.80			1.20 - 1.80		

Diameter →

Length l_1 ↓

	M3	M4	M5	M6
	Order No.	Order No.	Order No.	Order No.
6 mm	13-03-006*	13-04-006*	--	--
8 mm	13-03-008	13-04-008	13-05-008*	13-06-008*
10 mm	13-03-010	13-04-010	13-05-010*	13-06-010*
12 mm	13-03-012	13-04-012	13-05-012*	13-06-012*
15 mm	13-03-015	13-04-015*	13-05-015*	13-06-015*
16 mm	13-03-016	13-04-016*	13-05-016*	13-06-016*
20 mm	13-03-020	13-04-020*	13-05-020*	13-06-020*
25 mm	13-03-025	13-04-025*	13-05-025*	13-06-025*
30 mm	13-03-030	13-04-030*	13-05-030*	13-06-030*
35 mm	--	13-04-035*	13-05-035*	13-06-035*
40 mm	--	13-04-040*	13-05-040*	13-06-040*
45 mm	--	--	--	13-06-045*
50 mm	--	--	--	13-06-050*
Chuck	82-50-003	82-50-004	82-50-005	82-50-006
				
Chuck	84-50-003	84-50-004	84-50-005	84-50-006
				

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: M3 to M8 (M10 with modification only)
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

2) Similar to DIN EN ISO 13918

3) Due to the process and material properties a maximum stud diameter of M6 is recommended.

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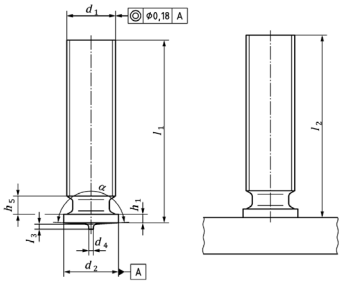
	Type	Material	Suitable for stud feeding	
			Manual	Automation[1]
	PT Threaded studs	AlMg3 (EN AW AlMg3)[3]	e.g. 	e.g. 

d_1	l_1 +0.6	d_2 ±0.2	d_4 ±0.08	l_3 ±0.05	max. h_5	h_1	α ±2°
M3	see table	4.50	0.60	0.55	0.60	0.70 - 1.40	174°
M4		5.50	0.65				
M5		6.50	0.75	0.80	1.00		
M6		7.50					
M8[3]		9.00		0.85	1.50	0.80 - 1.40	
M10[2][3]		10.70	0.80			1.20 - 1.80	



Diameter →

Length l_1 ↓	M3	M4	M5	M6
	Order No.	Order No.	Order No.	Order No.
6 mm	14-03-006*	14-04-006	--	--
8 mm	14-03-008	14-04-008	14-05-008	14-06-008*
10 mm	14-03-010*	14-04-010	14-05-010	14-06-010
12 mm	14-03-012*	14-04-012	14-05-012	14-06-012
15 mm	14-03-015	14-04-015	14-05-015	14-06-015
16 mm	14-03-016*	14-04-016	14-05-016	14-06-016
20 mm	14-03-020*	14-04-020	14-05-020	14-06-020
25 mm	14-03-025	14-04-025*	14-05-025	14-06-025
30 mm	14-03-030*	14-04-030	14-05-030*	14-06-030
35 mm	--	14-04-035*	14-05-035*	14-06-035*
40 mm	--	14-04-040	14-05-040*	14-06-040*
45 mm	--	--	--	14-06-045*
50 mm	--	--	--	14-06-050*
Chuck	82-50-003	82-50-004	82-50-005	82-50-006
				
Chuck	84-50-003	84-50-004	84-50-005	84-50-006
				

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

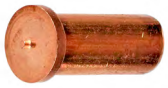
1) For automation: Diameter: M3 to M8 (M10 with modification only)
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

2) Similar to DIN EN ISO 13918

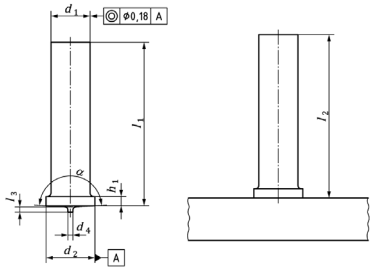
3) Due to the process and material properties a maximum stud diameter of M6 is recommended.

1

Unthreaded studs (pins) type UT

	Type	Material	Suitable for stud feeding	
			Manual	Automation[1)]
	UT Unthreaded studs (pins)*	Steel 4.8 copper coated (suitable for welding) A2-50, CuZn37, AlMg3	e.g. 	e.g. 

d_1±0.1	$l_{1\,min}$+0.6	d_2±0.2	d_4±0.08	l_3±0.05	h_1	α±2°
3	8	4.50	0.60	0.55	0.70 - 1.40	174°
4		5,50	0.65			
5	12	6,50	0.75	0.80		
6		7.50				
7.1	15	9		0.85	0.8 - 1.40	



Diameter →

Material	Ø 3 mm Order No.	Ø 4 mm Order No.	Ø 5 mm Order No.	Ø 6 mm Order No.	Ø 7.1 mm Order No.
Steel 4.8 copper coated (suitable for welding)	21-03-XXX	21-04-XXX	21-05-XXX	21-06-XXX	21-07-XXX
A2-50	22-03-XXX	22-04-XXX	22-05-XXX	22-06-XXX	22-07-XXX
CuZn37	23-03-XXX	23-04-XXX	23-05-XXX	23-06-XXX	--
AlMg3	24-03-XXX	24-04-XXX	24-05-XXX	24-06-XXX	--

Chuck	82-50-003	82-50-004	82-50-005	82-50-006	82-50-071
					
Chuck	84-50-003	84-50-004	84-50-005	84-50-006	84-50-071
					

Further accessories see accessories catalogue

* Not in stock, minimum order quantity, delivery time and price upon request.
Please send us the article number with your request. In the article number "XXX" is to be replaced by the respective length (e.g. 025 for 25 mm).

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: 3 to 7.1 mm
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

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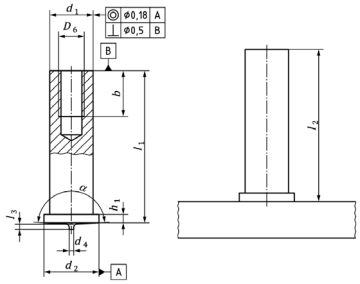
	Type	Material	Suitable for stud feeding	
			Manual	Automation[1]
	IT Studs with internal thread	Steel 4.8 copper coated (suitable for welding)	e.g. 	e.g. 

d_1 ±0.1	D_6	l_1 ±0.6	b_{min} +2P	d_2 ±0.2	d_4 ±0.08	l_3 ±0.05	h_1	α ±2°
5	M3	see table	5	6.5	0.75	0.80	0.7-1.4	174°
6[2]	M3[2]		6	7.5				
6	M4							
7.1	M5			9		0.85	0.8-1.4	
8	M6		9					



Diameter →

Length l_1	M3 / Ø 5 mm	M3 / Ø 6 mm	M4 / Ø 6 mm	M5 / Ø 7,1 mm	M6 / Ø 8 mm
	Order No.	Order No.	Order No.	Order No.	Order No.
8 mm[2]	31-35-008	31-36-008*	31-46-008	--	--
10 mm	31-35-010	31-36-010*	31-46-010	31-57-010	31-68-010*
12 mm	31-35-012	31-36-012*	31-46-012	31-57-012	31-68-012*
15 mm	31-35-015*	31-36-015*	31-46-015	31-57-015	31-68-015*
16 mm	31-35-016*	31-36-016*	31-46-016	31-57-016*	31-68-016*
20 mm	31-35-020*	31-36-020*	31-46-020*	31-57-020	31-68-020*
25 mm	31-35-025*	31-36-025*	31-46-025*	31-57-025	31-68-025*
30 mm	31-35-030*	31-36-030*	31-46-030*	31-57-030	31-68-030*
35 mm	--	--	31-46-035*	--	--
Chuck	82-50-905	82-50-906	82-50-906	82-50-971	82-50-908
					
Chuck	84-50-005	84-50-006	84-50-006	84-50-071	84-50-008
					

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

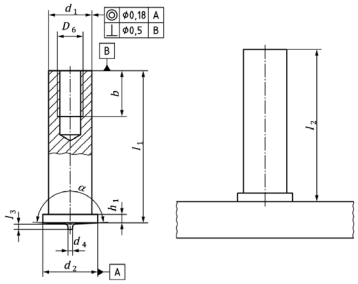
Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: 5 to 8 mm
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

2) Similar to DIN EN ISO 13918

	Type	Material	Suitable for stud feeding	
			Manual	Automation[1]
	IT Studs with internal thread	A2-50	e.g. 	e.g. 

d_1 ±0.1	D_6	l_1 ±0.6	b_{min} +2P	d_2 ±0.2	d_4 ±0.08	l_3 ±0.05	h_1	α ±2°
5	M3	see table	5	6.5	0.75	0.80	0.7-1.4	174°
6[2]	M3[2]		6	7.5				
6	M4							
7.1	M5			9		0.85	0.8-1.4	
8	M6		9					



Diameter →

Length l_1 ↓	M3 / Ø 5 mm	M3 / Ø 6 mm	M4 / Ø 6 mm	M5 / Ø 7,1 mm	M6 / Ø 8 mm
	Order No.	Order No.	Order No.	Order No.	Order No.
6 mm[2]	32-35-006	--	--	--	--
8 mm[2]	32-35-008	32-36-008*	32-46-008	--	--
10 mm	32-35-010	32-36-010*	32-46-010	32-57-010	32-68-010*
12 mm	32-35-012	32-36-012*	32-46-012	32-57-012	32-68-012*
15 mm	32-35-015*	32-36-015*	32-46-015	32-57-015	32-68-015*
16 mm	32-35-016*	32-36-016*	32-46-016	32-57-016*	32-68-016*
20 mm	32-35-020	32-36-020*	32-46-020	32-57-020	32-68-020*
25 mm	32-35-025*	--	32-46-025*	32-57-025*	32-68-025*
30 mm	32-35-030*	--	32-46-030*	32-57-030*	32-68-030*
35 mm	--	--	32-46-035*	--	--
Chuck	82-50-905	82-50-906	82-50-906	82-50-971	82-50-908
						
Chuck	84-50-005	84-50-006	84-50-006	84-50-071	84-50-908
						

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: 5 to 8 mm
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

2) Similar to DIN EN ISO 13918

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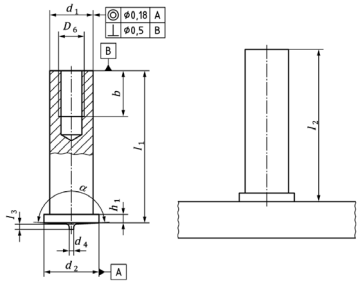
Type	Material	Suitable for stud feeding	
		Manual	Automation[1]
IT Studs with internal thread[3]	AlMg3 (EN AW AlMg3)[3]	e.g. 	e.g. 

d_1 ±0.1	D_6	l_1 ±0.6	b_{min} +2P	d_2 ±0.2	d_4 ±0.08	l_3 ±0.05	h_1	α ±2°
5	M3	see table	5	6.5	0.75	0.80	0.7-1.4	174°
6[2]	M3[2]		6	7.5				
6	M4							
7.1[3]	M5			9		0.85	0.8-1.4	
8[3]	M6		9					



Diameter →

Length l_1 ↓

	M3 / Ø 5 mm	M3 / Ø 6 mm	M4 / Ø 6 mm
	Order No.	Order No.	Order No.
6 mm[2]	34-35-006*	--	--
8 mm[2]	34-35-008	34-36-008*	34-46-008*
10 mm	34-35-010	34-36-010*	34-46-010*
12 mm	34-35-012	--	34-46-012*
15 mm	34-35-015*	--	34-46-015*
16 mm	34-35-016*	--	34-46-016*
20 mm	34-35-020*	34-36-020*	34-46-020*
25 mm	34-35-025*	--	34-46-025*
30 mm	34-35-030*	--	34-46-030*
35 mm	--	--	34-46-035*
Chuck	82-50-905	82-50-906	82-50-906
				
Chuck	84-50-005	84-50-006	84-50-006
				

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

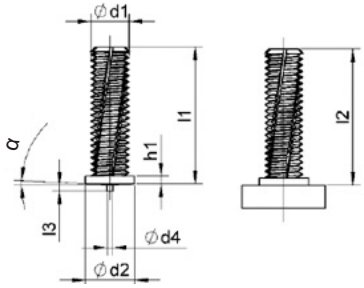
Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: 5 to 8 mm
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

2) Similar to DIN EN ISO 13918

3) Due to the process and material properties a maximum stud diameter of M6 is recommended.

	Type	Material	Suitable for stud feeding	
			Manual	Automation[1]
	CD Paint clearing threaded studs[2]	Steel 4.8 copper coated (suitable for welding)	e.g. 	e.g. 

d_1	l_1 +0.6	d_2 ±0.2	d_4 ±0.08	l_3 ±0.05	h_1	α ±1°	
M5	see table	6.50	0.75	0.80	0.70 - 1.40	3°	
M6		7.50	0.75	0.80			
M8		9	0.75	0.85	0.80 - 1.40		

Diameter →

Length l_1 ↓

	M5	M6	M8
	Order No.	Order No.	Order No.
6 mm	--	--	--
8 mm	--	--	--
10 mm	11-15-010*	11-16-010	11-18-010*
12 mm	11-15-012*	11-16-012*	11-18-012*
15 mm	11-15-015*	11-16-015	11-18-015*
16 mm	11-15-016*	11-16-016	--
20 mm	11-15-020*	11-16-020*	11-18-020*
25 mm	--	11-16-025*	--
Chuck	82-50-005	82-50-006	82-50-008
			
Chuck	84-50-005	84-50-006	84-50-008
			

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: M5 to M8
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

2) Similar to DIN EN ISO 13918

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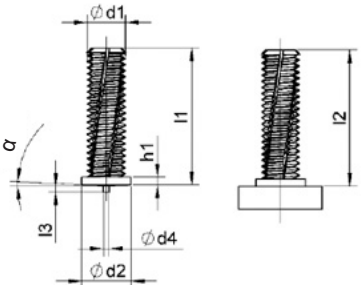
	Type	Material	Suitable for stud feeding	
			Manual	Automation[1]
	CD Paint clearing threaded studs[2][3]	CuZn37[3]	e.g. 	e.g. 

d_1	l_1 ±0.6	d_2 ±0.2	d_4 ±0.08	l_3 ±0.05	h_1	α ±1°	
M5	see table	6.50	0.75	0.80	0.70 - 1.40	3°	
M6		7.50	0.75	0.80			
M8[3]		9	0.75	0.85	0.80 - 1.40		

Diameter →

Length l_1 ↓

	M5	M6
	Order No.	Order No.
6 mm	--	--
8 mm	13-15-008	--
10 mm	13-15-010	--
12 mm	13-15-012	--
14 mm		13-16-014*
15 mm	--	--
16 mm	13-15-016	13-16-016*
20 mm	13-15-020	--
25 mm	--	--
Chuck	82-50-005	82-50-006
		
Chuck	84-50-005	84-50-006
		

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

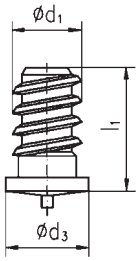
Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: M5 to M8
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

2) Similar to DIN EN ISO 13918

3) Due to the process and material properties a maximum stud diameter of M6 is recommended.

	Type	Material	Suitable for stud feeding	
			Manual	Automation[1]
	CD Fir tree studs[2]	Steel 4.8 copper coated (suitable for welding) A2-50	e.g. 	e.g. 

d_1	l_1	d_3±0.2	
5.0	9.0	6.5	
	14.2		
	18.2		
	25.0		

Details that are not defined are left to the manufacturer.

Material	Diameter	Ø 5 x 9 mm	Ø 5 x 14.2 mm	Ø 5 x 18 mm	Ø 5 x 25 mm
		Order No.	Order No.	Order No.	Order No.
Steel 4.8 copper coated (suitable for welding)		10-15-009	10-15-014	10-15-018	10-15-025
A2-50		10-35-009	10-35-014	10-35-018	10-35-025
Chuck		82-50-005	82-50-005	82-50-005	82-50-005
					
Chuck		84-50-005	84-50-005	84-50-005	84-50-005
					

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: M4 to M8
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

2) Similar to DIN EN ISO 13918

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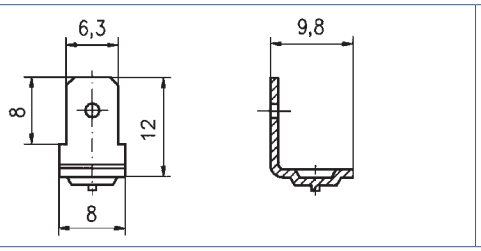
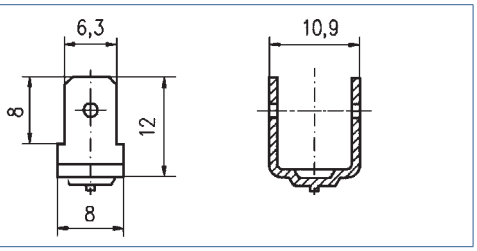
	Type	Material	Suitable for stud feeding Manual
	Ground clips (single and double style)	Steel 4.8 copper coated (suitable for welding) A2-50, CuZn37, AlMg3	e.g. 





Details that are not defined are left to the manufacturer.
Variations possible. Variations in dimensions do not impair the weld quality.

Material	Steel (4.8) copper coated	A2-50	CuZn37	AlMg3
Ground clips (single style)				
Order No.	30-10-063	30-20-063	30-30-063*	30-40-063
Ground clips (double style)				
Order No.	30-12-063	30-22-063	30-32-063*	30-42-063
Chuck	82-50-050	82-50-050	82-50-050	82-50-050
				

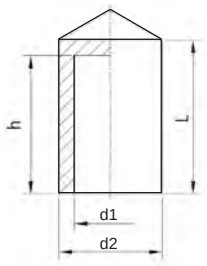
Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

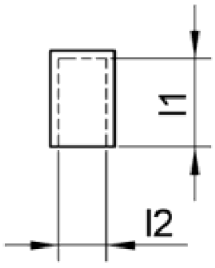
Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

	Type	Suitable for stud feeding
	Silicone cover*	Manual

Silicone cover for threaded studs and pins

Drawing	G	h	Order No.
	G3	12.0 mm	38-90-003*
	G4	12.0 mm	38-90-004*
	G5	12.0 mm	38-90-005*
	G6	12.0 mm	38-90-006*
	G8	12.0 mm	38-90-008*
	G10	30.0 mm	38-90-010*

Silicone cover for ground clips (single and double style)

Drawing	l1	l2	Order No.
	11.0 mm	6.0 mm	38-90-063*

* Not in stock, dimension, minimum order quantity, delivery time and price upon request.

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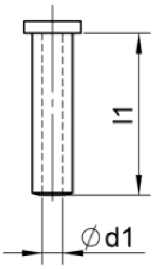
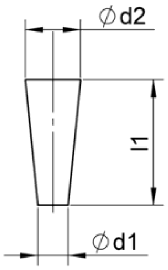
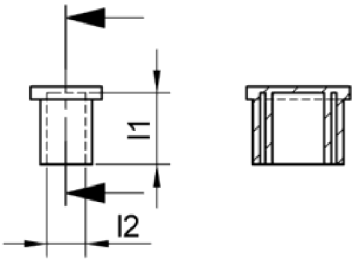
	Type	Suitable for stud feeding
	Silicone cover*	Manual

Further types (on request):

Silicone cover for threaded studs and pins	Silicone cover for studs with internal thread	Silicone cover for ground clips (single and double style)
		

* Not in stock, dimension, minimum order quantity, delivery time and price upon request.

2

Welding process:
Drawn arc stud welding

Welding elements type RD
Threaded studs with reduced shaft

Name for a metric threaded stud according to DIN EN ISO 13918

Mild steel 4.8
from page 28

A2-50
from page 29

4.8 nickel coated (E2E)
from page 30

Welding elements type MD (DD)
Virtually fully-threaded studs

Name for a metric threaded stud similar to DIN EN ISO 13918

Mild steel 4.8
from page 34

A2-50
from page 35

Welding elements type PD
Partially threaded studs

Name for a metric threaded stud according to DIN EN ISO 13918

Mild steel 4.8
from page 38

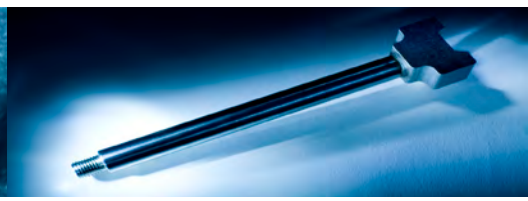
A2-50
from page 38

Welding elements type UD
Unthreaded studs (pins)

Name for an unthreaded stud according to DIN EN ISO 13918

Mild steel 4.8
from page 40

A2-50
from page 40



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Welding process:
Drawn arc stud welding

Welding elements type ID
Studs with internal thread

Name for a stud (pin) with internal thread according to DIN EN ISO 13918

Mild steel 4.8
from page 42

A2-50
from page 42

Welding elements type SD
Shear connectors / Concrete anchors

Name for a shear connector according to DIN EN ISO 13918

S235J2G3+C450
from page 44

Ceramic ferrules (CF)

To contain the weld pool when using welding elements with flux (aluminium ball).

The inner diameter of the ceramic ferrules must be suitable for the welding task. Welding elements and ceramic ferrules are generally a matched system from the same manufacturer. Ceramic ferrules without welding elements are not available.

from page 45

2

Stud types, abbreviations, material, norm, mechanical characteristics according to DIN EN ISO 13918

Stud types		Abbreviations for studs (ceramic ferrules)		Material	Norm	Mechanical characteristics tensile strength R_m upper yield strength R_{eH} 0,2 % yield strength $R_{p0,2}$ elongation A_5
Drawn arc welding with ceramic ferrule (CF) or shielding gas (SG)	Partially threaded stud	PD (PF) MD (UF)		Mild steel 4.8[1)]	ISO 898-1	$R_m \geq 420$ N/mm² $R_{eH} \geq 340$ N/mm²
	Threaded stud with reduced shaft	RD (RF)		A2-50 A2-70, A4-50, A4-70, A5-50, A5-70	ISO 3506-1	$R_m \geq 500$ N/mm² $R_{p0,2} \geq 210$ N/mm²
	Unthreaded stud (Pin)	UD (UF)				
	Stud with internal thread	ID (IF)				
	Shear connectors	SD (UF)	SD1 (UF)	e.g. S 235 J2G3+C450 C≤0,2%; CEV≤0,38; Al ≥ 0,02%	ISO/TR 15608 Material group 1	$R_m \geq 450$ N/mm² $R_{eH} \geq 350$ N/mm² $A_5 \geq 15$ %
			SD3 (UF)	X5CrNi18-10 (1.4301) X6CrNi18-12 (1.4303)	ISO 15510	$R_m \geq 500$ - 780 N/mm² $R_{p0,2} \geq 350$ N/mm² $A_5 \geq 25$ %

Further material upon request

[1)] suitable for welding

Mounting tightening torque

Threaded stud	Steel 4.8[1)] $R_{p0,2}$ = 340 N/mm²	A2-50 $R_{p0,2}$ = 210 N/mm²	AlMg3 F23 $R_{p0,2}$ = 170 N/mm²
	Mounting tightening torques (Nm)		
M5	2.2	1.4	1.1
M6	4.0	2.5	2.0
M8	9.5	6.0	4.7
M10	18.5	12.0	9.5
M12	32.5	20.0	16.0
M16	80.0	50.0	
M20	155.0	95.0	
M24	270.0	165.0	
Torques in compliance with the following conditions: 1) $F_{Mperm}(\mu_{tot,5\,\%}) \geq F(\mu_{tot,5\,\%})$ 2) $F(\mu_{tot,95\,\%}) \geq 0{,}25\ R_{p0,2}A_S$			

Values correspond with DVS leaflet 0904

[1)] suitable for welding

All specified values are reference points for mounting tightening torques without lasting deformation of the joined parts. Prerequisite is that the jointed part have sufficient wall thickness. The values apply for cold-rolled threaded studs with standard thread without surface protection and without thread lubrication. At least the stress cross-section must be present over the entire stud length. The values apply for the specified yield strengths.

Recommendations for mounting tightening torques for common stud diameters and materials are provided in leaflet DVS 0904. The specified tightening torques ensure that the permissible mounting pretensioning force F_{Mperm} acc. to VDI directive 2230, Sheet 1, is not exceeded and plastic deformations in the connection are thereby avoided. Furthermore, under static loading, loosening of the nut should be prevented by achieving a pretensioning force of at least 25 % of the 0.2 % yield strength. In the event of deviation from the specified basic conditions, the required tightening parameters are to be determined on the basis of a process inspection.

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Material combinations

accrding to DIN EN ISO 14555 (Select stud material in a way that material of the same kind is welded)

Stud material	Base material			
	ISO/TR 15608 Groups 1 and 2.1	ISO/TR 15608 Groups 2.2, 3 to 6	ISO/TR 15608 Groups 8 and 10	ISO/TR 15608 Groups 21 and 22
Steel 4.8[1)]	a		b	--
A2-50	b/a		a	--
EN AW-AlMg3/EN AW-5754	--		--	b

Exemplification of welding suitability:
-- non weldable
a well suited for any application, e.g. power transmission
b suitable, limitations with power transmission

[1)] suitable for welding

Flux (Aluminium Ball)
Welding studs in steel (S235) 4.8[1)] (for drawn ARC welding with ceramic ferrule) have a flux (aluminium ball) on the welding area. The flux will ignite the arc easier and the welding bath will be deoxidized.
No flux necessary when welding with shielding gas.

Surface Treatment
The studs will be supplied without surface protection.
If the number of pieces exceeds a certain limit studs can also be delivered with following coatings:
– nickel coated
– copper coated
– zinc coated
Layer thickness corresponds with DIN EN ISO 4042; tolerance zone 6h DIN 13-20, could be achieved.
For coated threaded studs the tolerances apply before coating.

Threads
Non coated threaded studs are provided with a thread to DIN ISO 724, DIN EN ISO 4759-1, product class A, tolerance zone 6g. Thread run-in and run-out are decisions of the manufacturer. Galvanized threaded studs correspond with DIN EN ISO 4042, tolerance zone 6h.

[1)] suitable for welding

Cold rolling of thread shows the following advantages:
- no interruption of fiber orientation,
- increase of strength by up to 200 %,
- decrease of surface roughness in connection with
- increased corrosion resistance.

Type of Stud
- **Type MD (Type DD)**
  The thread covers the complete stud length which can be utilized after welding. The welding bulge is appr. 3 to 4 mm larger than the outside diameter of the stud.
- **Type RD**
  The base is not threaded and reduced approx. to the core diameter of the thread. The welding bulge is app. 0.5 to 1 mm larger than the outside diameter of the stud.
- **Type PD**
  The stud is partly threaded.

Welding elements with particular specifications available on request

Order key for welding elements PD, RD and DD

00-00-000
Length
Outer Ø
Material
Stud type

Stud type	
5	RD Threaded studs with reduced shaft
6	MD Virtually fully-threaded studs
7	PD Partially threaded studs

Material	
1	Mild steel 4.8
2	A2-50
7	Steel 4.8 nickel coated (E2E)

Order key for welding elements UD, ID and SD

00-00-000
Length
Outer Ø
Stud type and material

Stud type	
70	SC Shear connector type SD material S235/J2G3+C450
74	Unthreaded studs (pins) type UD material mild steel 4.8
75	Unthreaded studs (pins) type UD material A2-50
76	Pins with internal thread type ID material mild steel 4.8
77	Pins with internal thread type ID material A2-50

Order examples:

Threaded stud type RD M8 x 25, material mild steel (4.8), with ball	**Order No.** 51-08-025**K**
Threaded stud type MD M12 x 30, material A2-50, without ball	**Order No.** 62-12-030
Threaded stud type PD M10 x 40, material A2-50, with ball	**Order No.** 72-10-040**K**

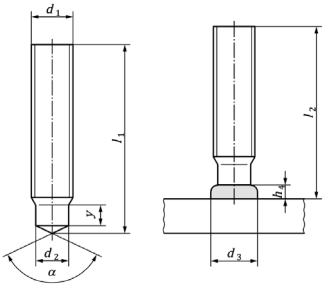
2

Threaded studs with reduced shaft type RD

(Ceramic ferrule included in delivery)

Type	Material	Suitable for stud feeding
		Manual
RD Threaded studs with reduced shaft (with ceramic ferrule)	Mild steel 4.8 (suitable for welding)	e.g. 

d_1	l_2 2)	d_2±0.1	d_3 1)	y+2P	h_4 1)	α± 7°
M6	see table	4.7	7.0	4.0	2.5	140°
M8		6.2	9.0	4.0	2.5	
M10		7.9	11.5	5.0	3.0	
M12		9.5	13.5	6.0	4.0	
M16		13.2	18.0	7.5	5.0	
M20		16.5	23.0	9.0	6.0	
M24		20.0	28.0	12.0	7.0	



Diameter →

Length l_2 ↓

	M6	M8	M10	M12	M16	M20	M24
	Order No.	Order No.	Order No.	Order No.	Order No.	Order No.	
20 mm	51-06-020K*	51-08-020K*	51-10-020K*	51-12-020K*	--	--	--
25 mm	51-06-025K*	51-08-025K*	51-10-025K*	51-12-025K*	--	--	--
30 mm	51-06-030K*	51-08-030K*	51-10-030K*	51-12-030K*	51-16-030K*	--	--
35 mm	51-06-035K*	51-08-035K*	51-10-035K*	51-12-035K*	51-16-035K*	--	--
40 mm	51-06-040K*	51-08-040K*	51-10-040K*	51-12-040K*	51-16-040K*	--	--
45 mm	--	51-08-045K*	51-10-045K*	51-12-045K*	51-16-045K*	--	--
50 mm	51-06-050K*	51-08-050K*	51-10-050K*	51-12-050K*	51-16-050K*	51-20-050K*	51-24-050K*
55 mm	--	--	51-10-055K*	51-12-055K*	51-16-055K*	51-20-055K*	--
60 mm	--	51-08-060K*	--	51-12-060K*	51-16-060K*	51-20-060K*	--
65 mm	--	--	--	--	51-16-065K*	--	--
70 mm	--	--	51-10-070K*	51-12-070K*	51-16-070K*	--	--
80 mm	--	--	51-10-080K*	51-12-080K*	51-16-080K*	--	--
90 mm	--	--	--	51-12-090K*	--	51-20-090K*	--
100 mm	--	--	51-10-100K*	--	51-16-100K*	--	--

Chuck	83-50-006	83-50-008	83-50-010	83-50-012	83-50-016	83-50-020	83-50-024
							
Ceramic ferrule grip	80-31-095	80-31-120	80-31-150	80-31-170	80-30-116	80-31-262	80-31-307
							
Ceramic ferrule	50-50-006	50-50-008	50-50-010	50-50-012	50-50-016	50-50-020K	50-50-024K
							

Further accessories see accessories catalogue

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1) The dimensions of stud collars are guidance values and may be generally achieved in welding position PA according to ISO 6947. The weld collars are subject to variations regarding evenness and shape.

2) The nominal length l_2 (length after welding) is a design value. By proper control of the welding it is possible to keep variations in l_2 within ±1 mm.

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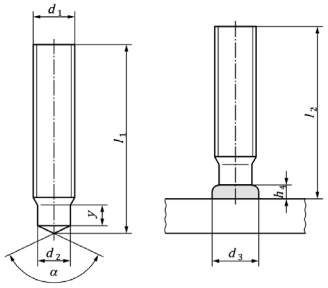
(Ceramic ferrule included in delivery)

Type	Material	Suitable for stud feeding
		Manual
RD Threaded studs with reduced shaft (with ceramic ferrule)	A2-50	e.g. 

d_1	l_2 [2]	d_2±0.1	d_3 [1]	y+2P	h_4 [1]	α± 7°
M6	see table	4.7	7.0	4.0	2.5	140°
M8		6.2	9.0	4.0	2.5	
M10		7.9	11.5	5.0	3.0	
M12		9.5	13.5	6.0	4.0	
M16		13.2	18.0	7.5	5.0	
M20		16.5	23.0	9.0	6.0	
M24		20.0	28.0	12.0	7.0	



Diameter →

Length l_2 ↓

	M6	M8	M10	M12	M16	M20	M24
	Order No.	Order No.	Order No.	Order No.	Order No.	Order No.	
20 mm	52-06-020K*	52-08-020K*	52-10-020K*	52-12-020K*	--	--	--
25 mm	52-06-025K*	52-08-025K*	52-10-025K*	52-12-025K*	--	--	--
30 mm	52-06-030K*	52-08-030K*	52-10-030K*	52-12-030K*	52-16-030K*	--	--
35 mm	52-06-035K*	52-08-035K*	52-10-035K*	52-12-035K*	52-16-035K*	--	--
40 mm	52-06-040K*	52-08-040K*	52-10-040K*	52-12-040K*	52-16-040K*	--	--
45 mm	--	52-08-045K*	52-10-045K*	52-12-045K*	52-16-045K*	--	--
50 mm	52-06-050K*	52-08-050K*	52-10-050K*	52-12-050K*	52-16-050K*	52-20-050K*	52-24-050K*
55 mm	--	--	52-10-055K*	52-12-055K*	52-16-055K*	52-20-055K*	--
60 mm	--	--	52-10-060K*	52-12-060K*	52-16-060K*	52-20-060K*	--
65 mm	--	--	--	--	52-16-065K*	--	--
70 mm	--	--	52-10-070K*	52-12-070K*	52-16-070K*	--	--
75 mm	--	52-08-075K*	--	--	--	--	--
80 mm	--	--	52-10-080K*	52-12-080K*	52-16-080K*	--	--
90 mm	--	--	--	--	--	52-20-090K*	--
100 mm	--	--	52-10-100K*	52-12-100K*	52-16-100K*	--	--
Chuck	83-50-006	83-50-008	83-50-010	83-50-012	83-50-016	83-50-020	83-50-024
							
Ceramic ferrule grip	80-31-095	80-31-120	80-31-150	80-31-170	80-30-116	80-31-262	80-31-307
							
Ceramic ferrule	50-50-006	50-50-008	50-50-010	50-50-012	50-50-016	50-50-020K	50-50-024K
							

Further accessories see accessories catalogue

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1) The dimensions of stud collars are guidance values and may be generally achieved in welding position PA according to ISO 6947. The weld collars are subject to variations regarding evenness and shape.

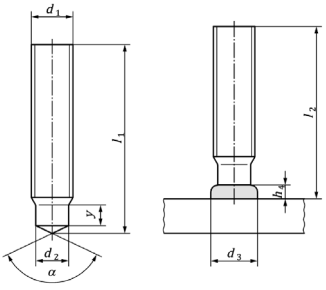
2) The nominal length l_2 (length after welding) is a design value. By proper control of the welding it is possible to keep variations in l_2 within ±1 mm.

2

Threaded studs with reduced shaft type RD

 (Ceramic ferrule included in delivery)	**Type**	**Material**	Suitable for stud feeding: Manual
	RD Threaded studs with reduced shaft (with ceramic ferrule)	Steel 4.8 nickel coated (E2E) (suitable for welding)	e.g. 

d_1	l_2 2)	d_2±0.1	d_3 1)	y+2P	h_4 1)	α± 7°
M6	see table	4.7	7.0	4.0	2.5	140°
M8		6.2	9.0	4.0	2.5	
M10		7.9	11.5	5.0	3.0	
M12		9.5	13.5	6.0	4.0	
M16		13.2	18.0	7.5	5.0	
M20		16.5	23.0	9.0	6.0	
M24		20.0	28.0	12.0	7.0	



Diameter →

Length l_2 ↓

	M12	M16	M20
	Order No.	Order No.	Order No.
20 mm	57-12-020K*	--	--
25 mm	57-12-025K*	--	--
30 mm	57-12-030K*	57-16-030K*	--
35 mm	--	--	--
40 mm	57-12-040K*	57-16-040K*	--
45 mm	--	57-16-045K*	--
50 mm	57-12-050K*	57-16-050K*	57-20-050K*
60 mm	57-12-060K*	--	--
70 mm	57-12-070K*	--	--
Chuck	83-50-012	83-50-016	83-50-020
			
Ceramic ferrule grip	80-31-170	80-30-116	80-31-262
			
Ceramic ferrule	50-50-012	50-50-016	50-50-020K
			

Further accessories see accessories catalogue

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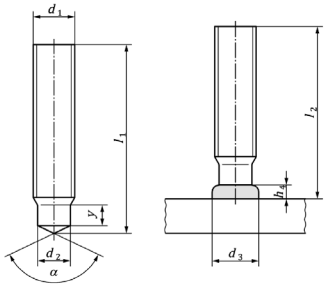
(Delivery **without** ceramic ferrule)

Type	Material	Suitable for stud feeding
		Manual
RD Threaded studs with reduced shaft (with shielding gas)	Mild steel 4.8 (suitable for welding)	e.g. 

d_1	l_2 [2]	$d_2 \pm_{0.1}$	d_3 [1]	y+2P	h_4 [1]	α± 7°
M6	see table	4.7	7.0	4.0	2.5	140°
M8		6.2	9.0	4.0	2.5	
M10		7.9	11.5	5.0	3.0	
M12		9.5	13.5	6.0	4.0	
M16		13.2	18.0	7.5	5.0	
M20		16.5	23.0	9.0	6.0	
M24		20.0	28.0	12.0	7.0	



Diameter →

Length l_2 ↓

	M6	M8	M10	M12	M16
	Order No.	Order No.	Order No.	Order No.	Order No.
10 mm	51-06-010*	--	--	--	--
12 mm	--	51-08-012*	51-10-012*	--	--
15 mm	51-06-015*	51-08-015*	51-10-015*	--	--
20 mm	51-06-020*	51-08-020*	51-10-020	51-12-020*	--
25 mm	51-06-025*	51-08-025*	51-10-025	51-12-025*	--
30 mm	51-06-030*	51-08-030*	51-10-030	51-12-030*	51-16-030*
35 mm	51-06-035*	51-08-035*	51-10-035*	51-12-035*	51-16-035*
40 mm	51-06-040*	51-08-040*	51-10-040*	51-12-040*	51-16-040*
45 mm	51-06-045*	51-08-045*	51-10-045*	51-12-045*	51-16-045*
50 mm	51-06-050*	51-08-050*	51-10-050*	51-12-050*	51-16-050*
55 mm	--	--	51-10-055*	51-12-055*	51-16-055*
60 mm	--	--	51-10-060*	51-12-060*	51-16-060*
Chuck	83-51-006	83-51-008	83-51-010	83-51-012	83-51-016
					

Further accessories see accessories catalogue

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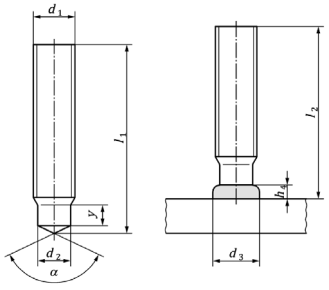
2) The nominal length l_2 (length after welding) is a design value. By proper control of the welding it is possible to keep variations in l_2 within ±1 mm.

 (Delivery **without** ceramic ferrule)	**Type**	**Material**	Suitable for stud feeding: Manual
	RD Threaded studs with reduced shaft (with shielding gas)	A2-50	e.g. 

d_1	l_2 [2]	$d_2 \pm_{0.1}$	d_3 [1]	y+2P	h_4 [1]	α± 7°
M6	see table	4.7	7.0	4.0	2.5	140°
M8		6.2	9.0	4.0	2.5	
M10		7.9	11.5	5.0	3.0	
M12		9.5	13.5	6.0	4.0	
M16		13.2	18.0	7.5	5.0	
M20		16.5	23.0	9.0	6.0	
M24		20.0	28.0	12.0	7.0	



Diameter →

Length l_2	M6	M8	M10	M12	M16
	Order No.	Order No.	Order No.	Order No.	Order No.
10 mm	52-06-010	--	--	--	--
12 mm	--	52-08-012*	--	--	--
15 mm	52-06-015	52-08-015	52-10-015	--	--
20 mm	52-06-020	52-08-020	52-10-020	52-12-020	--
25 mm	52-06-025	52-08-025	52-10-025	52-12-025	--
30 mm	52-06-030	52-08-030	52-10-030	52-12-030	52-16-030*
35 mm	52-06-035*	52-08-035*	52-10-035*	52-12-035	52-16-035*
40 mm	52-06-040*	52-08-040*	52-10-040*	52-12-040*	52-16-040*
45 mm	52-06-045*	52-08-045*	52-10-045*	52-12-045*	52-16-045*
50 mm	52-06-050*	52-08-050*	52-10-050*	52-12-050*	52-16-050*
55 mm	--	--	52-10-055*	52-12-055*	52-16-055*
60 mm	--	--	52-10-060*	52-12-060*	52-16-060*
70 mm	--	--	52-10-070	--	--
80 mm	--	--	52-10-080	--	--
100 mm	--	--	52-10-100	--	--
Chuck	83-51-006	83-51-008	83-51-010	83-51-012	83-51-016
					

Further accessories see accessories catalogue

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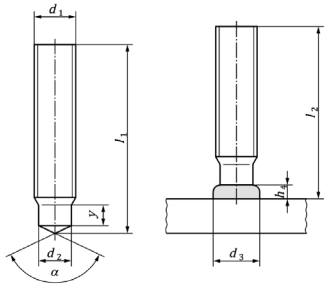
(Delivery **without** ceramic ferrule)

Type	Material	Suitable for stud feeding
		Manual
RD Threaded studs with reduced shaft (with shielding gas)	Steel 4.8 nickel coated (E2E) (suitable for welding)	e.g. 

d_1	l_2 [2)]	$d_2 \pm_{0.1}$	d_3 [1)]	y+2P	h_4 [1)]	α± 7°
M6	see table	4.7	7.0	4.0	2.5	140°
M8		6.2	9.0	4.0	2.5	
M10		7.9	11.5	5.0	3.0	
M12		9.5	13.5	6.0	4.0	
M16		13.2	18.0	7.5	5.0	
M20		16.5	23.0	9.0	6.0	
M24		20.0	28.0	12.0	7.0	



Diameter →

Length l_2	M6	M8	M10	M12
	Order No.	Order No.	Order No.	Order No.
10 mm	57-06-010*	--	--	--
12 mm	57-06-012*	57-08-012	57-10-012*	--
15 mm	57-06-015*	57-08-015	57-10-015*	--
20 mm	57-06-020*	57-08-020	57-10-020*	--
25 mm	--	57-08-025	57-10-025*	--
30 mm	57-06-030*	57-08-030	57-10-030*	57-12-030*
35 mm	--	57-08-035	57-10-035*	57-12-035*
40 mm	--	57-08-040	57-10-040*	57-12-040*
45 mm	--	57-08-045	57-10-045*	57-12-045*
50 mm	--	57-08-050	57-10-050*	57-12-050*
55 mm	--	--	57-10-055*	57-12-055*
60 mm	--	--	57-10-060*	57-12-060*
Chuck	83-51-006	83-51-008	83-51-010	83-51-012
					

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

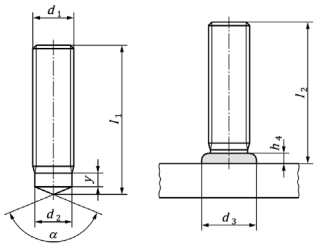
1) The dimensions of stud collars are guidance values and may be generally achieved in welding position PA according to ISO 6947. The weld collars are subject to variations regarding evenness and shape.

2) The nominal length l_2 (length after welding) is a design value. By proper control of the welding it is possible to keep variations in l_2 within ±1 mm.

(Ceramic ferrule included in delivery)

Type	Material	Suitable for stud feeding
		Manual
MD (DD) Virtually fully-threaded studs [3] (with ceramic ferrule)	Mild steel 4.8 (suitable for welding)	e.g. 

d_1	l_2 [2]	d_2±0.1	d_3	y+2P	h_4	α±7°
M6	see table	5.35	9.0	5.5	3.5	140°
M8		7.19	9.9	6	3.0	
M10		9.03	12.5	6.5	3.4	
M12		10.86	14.5	7.5	4.2	
M16		14.60	17.8	11	5.8	



Diameter →

Length l_2 ↓

	M6	M8	M10	M12	M16
	Order No.	Order No.	Order No.	Order No.	Order No.
20 mm	61-06-020K*	61-08-020K*	61-10-020K*	--	--
25 mm	61-06-025K*	61-08-025K*	61-10-025K*	61-12-025K*	--
30 mm	61-06-030K*	61-08-030K*	61-10-030K*	61-12-030K*	61-16-030K*
35 mm	61-06-035K*	61-08-035K*	61-10-035K*	61-12-035K*	61-16-035K*
40 mm	61-06-040K*	61-08-040K*	61-10-040K*	61-12-040K*	61-16-040K*
45 mm	--	61-08-045K*	61-10-045K*	61-12-045K*	--
50 mm	--	61-08-050K*	61-10-050K*	61-12-050K*	61-16-050K*
55 mm	--	--	61-10-055K*	61-12-055K*	61-16-055K*
60 mm	--	--	61-10-060K*	61-12-060K*	61-16-060K*
Chuck	83-50-006	83-50-008	83-50-010	83-50-012	83-50-016
					
Ceramic ferrule grip	80-31-095	80-31-150	80-31-150	80-31-205	80-31-262
					
Ceramic ferrule	50-60-006	50-60-008	50-60-010	50-60-012	50-60-016
					

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) The dimensions of stud collars are guidance values and may be generally achieved in welding position PA according to ISO 6947. The weld collars are subject to variations regarding evenness and shape.

2) The nominal length l_2 (length after welding) is a design value. By proper control of the welding it is possible to keep variations in l_2 within ± 1 mm.

3) Similar to DIN EN ISO 13918

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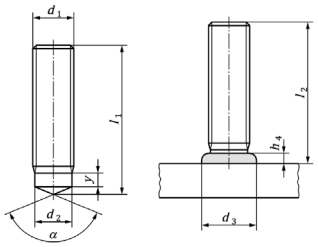
(Ceramic ferrule included in delivery)

Type	Material	Suitable for stud feeding
		Manual
MD (DD) Virtually fully-threaded studs [3] (with ceramic ferrule)	A2-50	e.g. 

d_1	l_2 [2]	d_2±0.1	d_3	y+2P	h_4	α±7°
M6	see table	5.35	9.0	5.5	3.5	140°
M8		7.19	9.9	6	3.0	
M10		9.03	12.5	6.5	3.4	
M12		10.86	14.5	7.5	4.2	
M16		14.60	17.8	11	5.8	



Diameter →

Length l_2 ↓

	M6	M8	M10	M12	M16
	Order No.	Order No.	Order No.	Order No.	Order No.
20 mm	62-06-020K*	62-08-020K*	62-10-020K*	--	--
25 mm	62-06-025K*	62-08-025K*	62-10-025K*	62-12-025K*	--
30 mm	62-06-030K*	62-08-030K*	62-10-030K*	62-12-030K*	62-16-030K*
35 mm	62-06-035K*	62-08-035K*	62-10-035K*	62-12-035K*	62-16-035K*
40 mm	62-06-040K*	62-08-040K*	62-10-040K*	62-12-040K*	62-16-040K*
45 mm	--	62-08-045K*	62-10-045K*	--	--
50 mm	--	62-08-050K*	62-10-050K*	62-12-050K*	62-16-050K*
55 mm	--	--	62-10-055K*	62-12-055K*	62-16-055K*
60 mm	--	--	62-10-060K*	62-12-060K*	62-16-060K*
Chuck	83-50-006	83-50-008	83-50-010	83-50-012	83-50-016
					
Ceramic ferrule grip	80-31-095	80-31-150	80-31-150	80-31-205	80-31-262
					
Ceramic ferrule	50-60-006	50-60-008	50-60-010	50-60-012	50-60-016
					

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

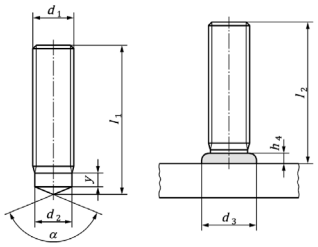
1) The dimensions of stud collars are guidance values and may be generally achieved in welding position PA according to ISO 6947. The weld collars are subject to variations regarding evenness and shape.

2) The nominal length l_2 (length after welding) is a design value. By proper control of the welding it is possible to keep variations in l_2 within ± 1 mm.

3) Similar to DIN EN ISO 13918

	Type	Material	Suitable for stud feeding
			Manual
 (Delivery **without** ceramic ferrule)	MD (DD) Virtually fully-threaded studs[3] (with shielding gas)	Mild steel 4.8 (suitable for welding)	e.g. 

d_1	l_2 [2]	d_2±0.1	d_3	y+2P	h_4	α±7°
M6	see table	5.35	9.0	5.5	3.5	140°
M8		7.19	9.9	6	3.0	
M10		9.03	12.5	6.5	3.4	
M12		10.86	14.5	7.5	4.2	
M16		14.60	17.8	11	5.8	



Diameter →

Length l_2	M6	M8	M10	M12	M16
	Order No.	Order No.	Order No.	Order No.	Order No.
15 mm	61-06-015*	61-08-015*	--	--	--
20 mm	61-06-020*	61-08-020*	61-10-020*	--	--
25 mm	61-06-025*	61-08-025*	61-10-025*	61-12-025*	--
30 mm	61-06-030*	61-08-030*	61-10-030*	61-12-030*	61-16-030*
35 mm	61-06-035*	61-08-035*	61-10-035*	61-12-035*	61-16-035*
40 mm	61-06-040*	61-08-040*	61-10-040*	61-12-040*	61-16-040*
45 mm	--	61-08-045*	61-10-045*	61-12-045*	61-16-045*
50 mm	--	61-08-050*	61-10-050*	61-12-050*	61-16-050*
55 mm	--	--	61-10-055*	61-12-055*	61-16-055*
60 mm	--	--	61-10-060*	61-12-060*	61-16-060*
Chuck	83-51-006	83-51-008	83-51-010	83-51-012	83-51-016
					

Further accessories see accessories catalogue

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3) Similar to DIN EN ISO 13918

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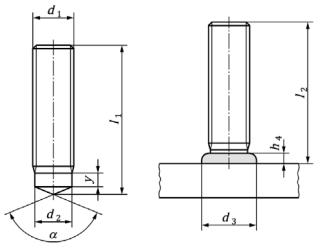
	Type	Material	Suitable for stud feeding
 (Delivery **without** ceramic ferrule)	MD (DD) Virtually fully-threaded studs[3] (with shielding gas)	A2-50	Manual e.g. 

d_1	l_2 [2]	d_2±0.1	d_3	y+2P	h_4	α±7°
M6	see table	5.35	9.0	5.5	3.5	140°
M8		7.19	9.9	6	3.0	
M10		9.03	12.5	6.5	3.4	
M12		10.86	14.5	7.5	4.2	
M16		14.60	17.8	11	5.8	



Diameter →

Length l_2	M6	M8	M10	M12	M16
	Order No.	Order No.	Order No.	Order No.	Order No.
15 mm	62-06-015*	62-08-015*	--	--	--
20 mm	62-06-020*	62-08-020*	62-10-020*	--	--
25 mm	62-06-025*	62-08-025*	62-10-025*	62-12-025*	--
30 mm	62-06-030*	62-08-030*	62-10-030*	62-12-030*	62-16-030*
35 mm	62-06-035*	62-08-035*	62-10-035*	62-12-035*	62-16-035*
40 mm	62-06-040*	62-08-040*	62-10-040*	62-12-040*	62-16-040*
45 mm	--	62-08-045*	62-10-045*	62-12-045*	62-16-045*
50 mm	--	62-08-050*	62-10-050*	62-12-050*	62-16-050*
55 mm	--	--	62-10-055*	62-12-055*	62-16-055*
60 mm	--	--	62-10-060*	62-12-060*	62-16-060*
Chuck	83-51-006	83-51-008	83-51-010	83-51-012	83-51-016
					

Further accessories see accessories catalogue

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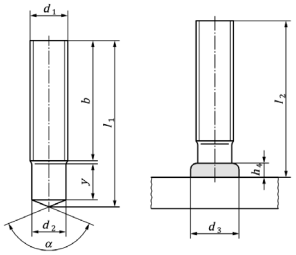
2) The nominal length l_2 (length after welding) is a design value. By proper control of the welding it is possible to keep variations in l_2 within ± 1 mm.

3) Similar to DIN EN ISO 13918

 (ceramic ferrule included in delivery)	**Type**	**Material**	Suitable for stud feeding: Manual
	PD Partially threaded studs* (with ceramic ferrule)	Mild steel 4.8 (suitable for welding) A2-50	e.g. 

d_1	d_2±0.1	d_3 [1]	h_4	α±7°
M6	5.35	8.5	3.5	140°
M8	7.19	10.0	3.5	
M10	9.03	12.5	4.0	
M12	10.86	15.5	4.5	
M16	14.6	19.5	6.0	
M20	18.38	24.5	7.0	
M24	22.05	30.0	10.0	



Diameter →

Material ↓

	M6	M8	M10	M12	M16	M20
	Order No.	Order No.	Order No.	Order No.	Order No.	Order No.
Mild steel 4.8 (suitable for welding)	71-06-XXX**K**	71-08-XXX**K**	71-10-XXX**K**	71-12-XXX**K**	71-16-XXX**K**	71-20-XXX**K**
A2-50	72-06-XXX**K**	72-08-XXX**K**	72-10-XXX**K**	72-12-XXX**K**	72-16-XXX**K**	72-20-XXX**K**
Chuck	83-50-006	83-50-008	83-50-010	83-50-012	83-50-016	83-50-020
						
Ceramic ferrule grip	80-31-095	80-31-120	80-31-150	80-31-170	80-30-116	80-31-262
						
Ceramic ferrule	50-50-006	50-50-008	50-50-010	50-50-012	50-50-016	50-50-020K
						

Further accessories see accessories catalogue

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Please send us the article number with your request. In the article number "XXX" is to be replaced by the respective length l_1 (e.g. 025 for 25 mm).

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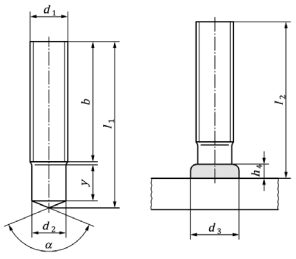
(delivery **without** ceramic ferrule)

Type	Material	Suitable for stud feeding
		Manual
PD Partially threaded studs* (with shielding gas)	Mild steel 4.8 (suitable for welding) A2-50	e.g. 

d_1	d_2±0.1	d_3 [1)]	h_4	α±7°
M6	5.35	8.5	3.5	140°
M8	7.19	10.0	3.5	
M10	9.03	12.5	4.0	
M12	10.86	15.5	4.5	
M16	14.6	19.5	6.0	
M20	18.38	24.5	7.0	
M24	22.05	30.0	10.0	



Diameter →

Material ↓

	M6	M8	M10	M12	M16	M20
	Order No.	Order No.	Order No.	Order No.	Order No.	Order No.
Mild steel 4.8 (suitable for welding)	71-06-XXX	71-08-XXX	71-10-XXX	71-12-XXX	71-16-XXX	71-20-XXX
A2-50	72-06-XXX	72-08-XXX	72-10-XXX	72-12-XXX	72-16-XXX	72-20-XXX
Chuck	83-51-006	83-51-008	83-51-010	83-51-012	83-51-016	83-51-020
						

Further accessories see accessories catalogue

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2) The nominal length l_2 (length after welding) is a design value. By proper control of the welding it is possible to keep variations in l_2 within ±1 mm.

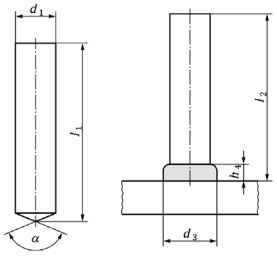
2

Unthreaded studs (pins) type UD

(Ceramic ferrule included in delivery)

Type	Material	Suitable for stud feeding
		Manual
UD Unthreaded studs (pins)* (with ceramic ferrule)	Mild steel 4.8 (suitable for welding) A2-50	e.g. 

d_1 ±0.1	d_3 [1)]	h_4	α ±7°	l_1 ±1
6	8.5	4	140°	l_2 + 2.4
8	11.0	4		l_2 + 2.6
10	13.0	4		l_2 + 2.8
12	16.0	5		l_2 + 3.4
14.6	18.5	6		l_2 + 3.9
16	21.0	7		l_2 + 3.9



Diameter →

Material ↓

	Ø 6 mm	Ø 8 mm	Ø 10 mm	Ø 12 mm	Ø 16 mm
	Order No.	Order No.	Order No.	Order No.	Order No.
Mild steel 4.8 (suitable for welding)	74-06-XXX**K**	74-08-XXX**K**	74-10-XXX**K**	74-12-XXX**K**	74-16-XXX**K**
A2-50	75-06-XXX**K**	75-08-XXX**K**	75-10-XXX**K**	75-12-XXX**K**	75-16-XXX**K**
Chuck	83-50-006	83-50-008	83-50-010	83-50-012	83-50-016
					
Ceramic ferrule grip	80-31-095	80-31-150	80-31-150	80-31-205	80-31-262
					
Ceramic ferrule	50-60-006	50-60-008	50-60-010	50-60-012	50-60-016
					

Further accessories see accessories catalogue

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1) The dimensions of stud collars are guidance values and may be generally achieved in welding position PA according to ISO 6947. The weld collars are subject to variations regarding evenness and shape.

2) The nominal length l_2 (length after welding) is a design value. By proper control of the welding it is possible to keep variations in l_2 within ±1 mm.

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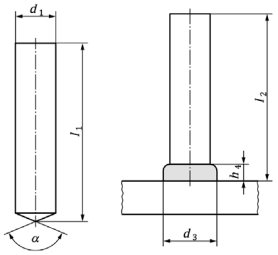
(delivery **without** ceramic ferrule)

Type	Material	Suitable for stud feedingg
		Manual
UD Unthreaded studs (pins)* (with shielding gas)	Mild steel 4.8 (suitable for welding) A2-50	e.g. 

d_1 ±0.1	d_3 [1]	h_4	α ±7°	l_1 ±1
6	8.5	4	140°	l_2 + 2.4
8	11.0	4		l_2 + 2.6
10	13.0	4		l_2 + 2.8
12	16.0	5		l_2 + 3.4
14.6	18.5	6		l_2 + 3.9
16	21.0	7		l_2 + 3.9



Diameter →

Material ↓

	Ø 6 mm	Ø 8 mm	Ø 10 mm	Ø 12 mm	Ø 16 mm
	Order No.	Order No.	Order No.	Order No.	Order No.
Mild steel 4.8 (suitable for welding)	74-06-XXX	74-08-XXX	74-10-XXX	74-12-XXX	74-16-XXX
A2-50	75-06-XXX	75-08-XXX	75-10-XXX	75-12-XXX	75-16-XXX
Chuck	83-51-006	83-51-008	83-51-010	83-51-012	83-51-016
					

Further accessories see accessories catalogue

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Please send us the article number with your request. In the article number "XXX" is to be replaced by the respective length (e.g. 025 for 25 mm).

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2) The nominal length l_2 (length after welding) is a design value. By proper control of the welding it is possible to keep variations in l_2 within ±1 mm.

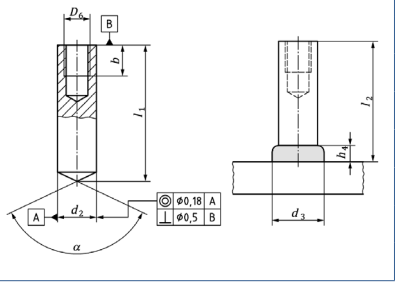
2

Studs with internal thread type ID

(Ceramic ferrule included in delivery)

Type	Material	Suitable for stud feeding
		Manual
ID Studs with internal thread* (with ceramic ferrule)	Mild steel 4.8 (suitable for welding) A2-50	e.g. 

D_6	d_2±0.1	d_3	b+2P	h_4	$l_{2\,min}$	l_1±1	α ±7°
M5	10	13	7.5	4	15	$l_{2\,min}$ + 2.3	140°
M6	10	13	9	4	15	$l_{2\,min}$ + 2.3	
M8	12	16	12	5	20	$l_{2\,min}$ + 2.8	
M8	14.6	18.5	15	6	25	$l_{2\,min}$ + 3.5	
M10	14.6	18.5	15	6	25	$l_{2\,min}$ + 3.5	
M10	16	21	15	7	25	$l_{2\,min}$ + 3.5	
M12	18.38	23	18	7	30	$l_{2\,min}$ + 3.7	



Diameter →

Material ↓

	M6 / Ø 10 mm	M8 / Ø 12 mm	M10 / Ø 16 mm
	Order No.	Order No.	Order No.
Mild steel 4.8 (suitable for welding)	76-10-XXX**K**	76-12-XXX**K**	76-16-XXX**K**
A2-50	77-10-XXX**K**	77-12-XXX**K**	77-16-XXX**K**
Chuck	83-50-010	83-50-012	83-50-016
			
Ceramic ferrule grip	80-31-150	80-31-205	80-31-262
			
Ceramic ferrule	50-60-010	50-60-012	50-60-016
			

Further accessories see accessories catalogue

* Not in stock. Minimum order quantity, delivery time and price upon request.
Please send us the article number with your request. In the article number "XXX" is to be replaced by the respective length (e.g. 025 for 25 mm).

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) The dimensions of stud collars are guidance values and may be generally achieved in welding position PA according to ISO 6947. The weld collars are subject to variations regarding evenness and shape.

2) The nominal length l_2 (length after welding) is a design value. By proper control of the welding it is possible to keep variations in l_2 within ± 1 mm.

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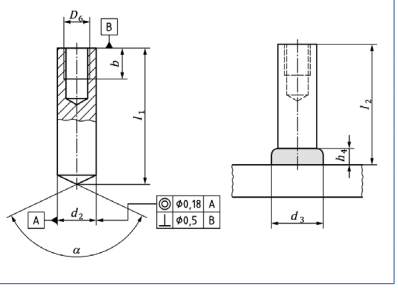
(Delivery **without** ceramic ferrule)

Type	Material	Suitable for stud feeding
		Manual
ID Studs with internal thread* (with shielding gas)	Mild steel 4.8 (suitable for welding) A2-50	e.g. 

D_6	d_2±0.1	d_3	b+2P	h_4	$l_{2\,min}$	l_1±1	α ±7°
M5	10	13	7.5	4	15	$l_{2\,min}$ + 2.3	
M6	10	13	9	4	15	$l_{2\,min}$ + 2.3	
M8	12	16	12	5	20	$l_{2\,min}$ + 2.8	
M8	14.6	18.5	15	6	25	$l_{2\,min}$ + 3.5	140°
M10	14.6	18.5	15	6	25	$l_{2\,min}$ + 3.5	
M10	16	21	15	7	25	$l_{2\,min}$ + 3.5	
M12	18.38	23	18	7	30	$l_{2\,min}$ + 3.7	



Diameter →

Material	M6 Ø 10 mm	M8 Ø 12 mm	M10 Ø 16 mm
	Order No.	Order No.	Order No.
Mild steel 4.8 (suitable for welding)	76-10-XXX	76-12-XXX	76-16-XXX
A2-50	77-10-XXX	77-12-XXX	77-16-XXX
Chuck	83-51-010	83-51-012	83-51-016
			

Further accessories see accessories catalogue

* Not in stock. Minimum order quantity, delivery time and price upon request.
Please send us the article number with your request. In the article number "XXX" is to be replaced by the respective length (e.g. 025 for 25 mm).

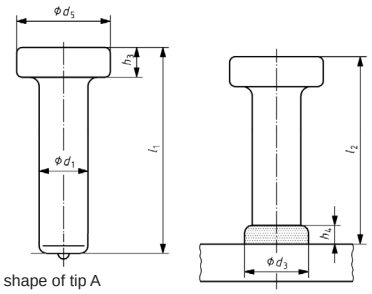
Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) The dimensions of stud collars are guidance values and may be generally achieved in welding position PA according to ISO 6947. The weld collars are subject to variations regarding evenness and shape.

2) The nominal length l_2 (length after welding) is a design value. By proper control of the welding it is possible to keep variations in l_2 within ± 1 mm.

 (Ceramic ferrule included in delivery)	**Type**	**Material**	Suitable for stud feeding: Manual
	SD Shear connectors / Concrete anchors (with ceramic ferrule)	S235J2G3+C450	e.g. 

d_1 ± 0,4[a, e]	d_5 ± 0.3[e]	d_3[c, f]	h_3 $^{+1}_{-0.5}$	h_4[c, f]	l_1 ± 1.5
9.5	19	13	7	2.5	l_2[b, c] + 3
10					
12.7	25	17	8	3	
13					
16	32[d]	21		4.5	l_2[b, c] + 4
19	32	23	10	6	l_2[b, c] + 4.5
22	35	29			l_2[b, c] + 5
25	41	31	12	7	l_2[b, c] + 5.5
25.4					



Diameter

Length l_2

	Ø 10 mm	Ø 13 mm	Ø 16 mm	Ø 19 mm	Ø 22 mm	Ø 25 mm
	Order No.	Order No.	Order No.	Order No.	Order No.	Order No.
75 mm	70-10-075*	70-13-075*	70-16-075*	70-19-075*	70-22-075*	70-25-075*
100 mm	70-10-100*	70-13-100*	70-16-100*	70-19-100*	70-22-100*	70-25-100*
125 mm	70-10-125*	70-13-125*	70-16-125*	70-19-125*	70-22-125*	70-25-125*
150 mm	70-10-150*	70-13-150*	70-16-150*	70-19-150*	70-22-150*	70-25-150*
175 mm	70-10-175*	70-13-175*	70-16-175*	70-19-175*	70-22-175*	70-25-175*
200 mm	--	70-13-200*	70-16-200*	70-19-200*	70-22-200*	70-25-200*
Chuck	83-53-010	83-53-012	83-53-019	83-53-019	83-53-022	83-53-025
						
Ceramic ferrule grip	80-30-210	80-30-213	80-30-219	80-30-219	80-30-222	88-15-823
						
Ceramic ferrule	50-60-010K	50-60-013K	50-60-016K	50-60-019K	50-60-022K	50-60-025K
						

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

a Excess diameter or production impressions in the shaft area below the head are permitted up to 0.5 mm, provided they do not affect proper plunge.

b Tolerance on l_2 is $^{+1.5}_{-2}$ mm.

c For special conditions, e.g. through-deck stud welding, the dimensions and the tolerances are not applicable.

d May be reduced to 29 mm for shear application.

e Use of the optional dimension depends on national regulations.

f The given values are for guidance only.

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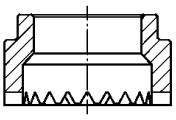
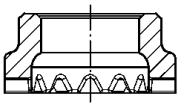
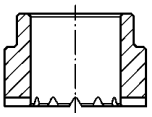
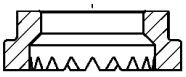
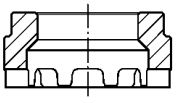
Ceramic ferrules

Order No.	Designation	Overall height in mm ±2	Overall Ø in mm ±2	Used for (type of stud)	Sketch
50-60-005	UF5	8	11.5	ND	
50-60-006	UF6	8	11.5	MD, UD, ID, SD	
50-60-008	UF8	8.5	15.5	MD, UD, ID	
50-60-010	UF10	10	18	MD, UD, ID	
50-60-012	UF12	10.5	20	MD, UD, ID	
--	UF12,7	11	22	SD	
50-60-013	UF13	11	22/26[a]	SD	
50-60-016	UF16	13	30	MD, UD, ID, SD	
--	UF19	16.5	31	SD	
50-60-020	UF20	16.5	31	MD, UD, ID	
50-60-022	UF22	19	39	SD	
50-70-006	PF6	6.5	11.5	PD	
50-70-008	PF8	6.5	15	PD	
50-70-010	PF10	6.5	18	PD	
50-70-012	PF12	9	20	PD	
50-70-016	PF16	11	26	PD	
--	PF20	10	34	PD	
--	PF24	18.5	39	PD	
50-50-006	RF6	10	12	RD	
50-50-008	RF8	9	15	RD	
50-50-010	RF10	11.5	18	RD	
50-50-012	RF12	13	20	RD	
50-50-016	RF16	15.5	30	RD	
50-50-020	RF20	22	32	RD	
50-50-024	RF24	25	33	RD	
50-51-016	RF16	9	30	RD	
--	RF20	9	32	RD	
--	RF24	13	36[a]	RD	
50-80-016	DF16[b]	17	30	SD	
50-80-019	DF19[b]	15	34	SD	
50-80-022	DF22[b]	19	39	SD	

a At the manufacturer‘s discretion

b For stud welding through decking sheet (through-deck stud welding)

3

Welding processes:
Drawn arc stud welding (short cycle SC)

Welding elements type PS
Threaded studs with flange

Name for a metric threaded stud according to DIN EN ISO 13918

4.8 copper coated
from page 50

A2-50
from page 51

Welding elements type US
Unthreaded studs (pins) with flange

Name for a pin according to DIN EN ISO 13918

4.8 copper coated
from page 52

A2-50
from page 52

Welding elements type IS
Studs with internal thread and flange

Name for a pin with internal thread according to DIN EN ISO 13918

4.8 copper coated
from page 53

A2-50
from page 53

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Welding processes:

Drawn arc stud welding (short cycle SC)

SC Paint clearing threaded studs

Name for a metric threaded stud with longitudinal grooves.

The welding geometry is designed similar to DIN EN ISO 13918.

Especially suitable for subsequent painting/coating.

4.8 copper coated

from page 54

SC Fir tree studs

Name for a threaded stud, also referred to as a saw tooth stud or coarse threaded stud. Fir tree studs have a special thread with a defined pitch (P) of 1.6 mm.

The welding geometry is designed similar to DIN EN ISO 13918.

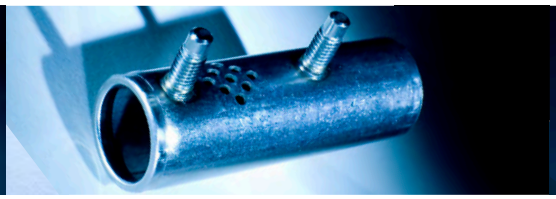
Especially suitable for the quick installation of snap-on elements such as plastic nuts or cable mountings.

4.8 copper coated

from page 55

A2-50

from page 55



3

Stud types, abbreviations, material, norm, mechanical characteristics according to DIN EN ISO 13918

Stud types		Abbreviations for studs	Material	Norm	Mechanical characteristics tensile strength R_m upper yield strength R_{eH} 0,2 % yield strength $R_{p0,2}$
Short cycle welding with drawn arc	Threaded stud with flange	PS	Steel 4.8[1] copper coated (C1E - ISO 4042)	ISO 898-1	$R_m \geq 420$ N/mm² $R_{eH} \geq 340$ N/mm²
	Pin with flange	US	A2-50 A2-70, A4-50, A4-70, A5-50, A5-70	ISO 3506-1	$R_m \geq 500$ N/mm² $R_{p0,2} \geq 210$ N/mm²
	Stud with internal thread and flange	IS			

Further material upon request

[1] suitable for welding

Mounting tightening torque

Threaded stud	Steel 4.8[1] $R_{p0.2}$ = 340 N/mm²	A2-50 $R_{p0.2}$ = 210 N/mm²	AlMg3 F23 $R_{p0.2}$ = 170 N/mm²
	Mounting tightening torques (Nm)		
M3	0.5	0.3	0.2
M4	1.2	0.7	0.6
M5	2.2	1.4	1.1
M6	4.0	2.5	2.0
M8	9.5	6.0	4.7
M10	18.5	12.0	9.5
Torques in compliance with the following conditions: 1) $F_{Mperm}(\mu_{tot,5\,\%}) \geq F(\mu_{tot,5\,\%})$ 2) $F(\mu_{tot,95\,\%}) \geq 0.25\ R_{p0.2}A_S$			

Values correspond with DVS-leaflet 0904

[1] suitable for welding

All specified values are reference points for mounting tightening torques without lasting deformation of the joined parts. Prerequisite is that the jointed part have sufficient wall thickness. The values apply for cold-rolled threaded studs with standard thread without surface protection and without thread lubrication. At least the stress cross-section must be present over the entire stud length. The values apply for the specified yield strengths.

Recommendations for mounting tightening torques for common stud diameters and materials are provided in leaflet DVS 0904. The specified tightening torques ensure that the permissible mounting pretensioning force F_{Mperm} acc. to VDI directive 2230, Sheet 1, is not exceeded and plastic deformations in the connection are thereby avoided. Furthermore, under static loading, loosening of the nut should be prevented by achieving a pretensioning force of at least 25 % of the 0.2 % yield strength. In the event of deviation from the specified basic conditions, the required tightening parameters are to be determined on the basis of a process inspection.

Material combinations

accrding to DIN EN ISO 14555 (Select stud material in a way that material of the same kind is welded)

Stud material	Base material			
	ISO/TR 15608 Groups 1 and 2.1	ISO/TR 15608 Groups 2.2, 3 to 6	ISO/TR 15608 Groups 8 and 10	ISO/TR 15608 Groups 21 and 22
Steel 4.8[1)] 16Mo3	a	b	b	--
A2-50	b/a	b	a	--
EN AW-AlMg3/EN AW-5754	--	--	--	b

Exemplification of welding suitability:
-- non weldable
a well suited for any application, e.g. power transmission
b suitable, limitations with power transmission

Weldability tests of other material combinations upon request.

[1)] suitable for welding

Stud Flange
The stud flange is designed according to DIN EN ISO 13918. The flange is part of the welding stud. Its diameter is bigger than the diameter of the stud. During welding, it prevents the arc from burning to the cylindrical part of the stud and increases the welding area simultaneously. This results in higher strength of the welded joint. The flange also serves to automatic feeding using HBS stud feeding units. Depending on requirements, you can use welding studs which have different flange dimensions or even no flange.

Flux (Aluminium Ball)
No flux necessary when welding with short cycle.

Surface Treatment
As standard, studs, pins and bushes (PS, US, IS) are protected against corrosion using steel (4.8) with galvanic copper coating (C1E). The coating thickness is between 3 and 5 µm.

Unless otherwise specified, studs PS, US and IS of property class 4.8 are supplied with electroplated copper coating (C1E).

Threads
Non coated threaded studs are provided with a thread to DIN ISO 724, DIN EN ISO 4759-1, product class A, tolerance zone 6g. Thread run-in and run-out are decisions of the manufacturer. Galvanized threaded studs correspond with DIN EN ISO 4042, tolerance zone 6h.

Cold rolling of thread shows the following advantages:
- no interruption of fiber orientation,
- increase of strength by up to 200 %,
- decrease of surface roughness in connection with
- increased corrosion resistance.

Welding elements with particular specifications available on request

Order key for welding elements

00-00-000
- Length
- Outer Ø
- Welding process
- Material
- Stud type

Stud type	
1	PS Threaded stud (previously FD)
2	US Unthreaded stud with flange

Material	
1	Steel 4.8 copper coated (C1E)
2	A2-50

00-0-00-000
- Length
- Outer Ø
- Welding process
- Internal Ø (Thread)
- Material
- Stud type

Stud type	
3	IS Stud with internal thread and flange

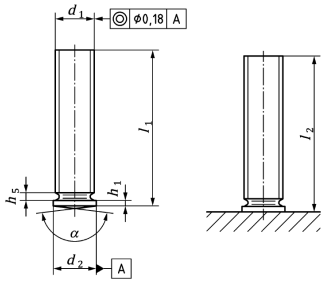
Welding process	
5	Short Cycle

Order examples:

Threaded stud type PS M6 x 25, material steel 4.8 copper coated (C1E) **Order No.** 11-56-025
Unthreaded stud (pin) type US Ø 3 x 4 mm, material A2-50 **Order No.** 22-53-004
Stud with internal thread type IS M4, Ø 6 mm, material steel 4.8 copper coated (C1E) **Order No.** 31-5-46-020

	Type	Material	Suitable for stud feeding	
			Manual	Automation[1)]
	PS Threaded studs with flange	Steel 4.8 copper coated (suitable for welding)	e.g. 	e.g. 

d_1	l_1+0,6	d_2±0.2	h_1	max. h_5	α±2°
M5	see table	6.0	0.7 - 1.40	1.0	166°
M6		7.0			
M8		9.0	0.80 - 1.40	1.5	



Diameter

Length l_1	M5	M6	M8
	Order No.	Order No.	Order No.
10 mm	11-55-010*	11-56-010*	--
12 mm	--	--	11-58-012*
15 mm	11-55-015*	11-56-015*	11-58-015*
16 mm	11-55-016*	11-56-016*	11-58-016*
20 mm	11-55-020*	11-56-020*	11-58-020*
25 mm	11-55-025*	11-56-025*	11-58-025*
30 mm	11-55-030*	11-56-030*	11-58-030*
35 mm	--	11-56-035*	11-58-035*
40 mm	--	11-56-040*	11-58-040*
Chuck	82-50-005	82-50-006	82-50-008
			
Chuck	83-51-005	83-51-006	83-51-008
			
Chuck	84-50-005	84-50-006	84-50-008
			

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: M3 to M8 (M10 with modification only)
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

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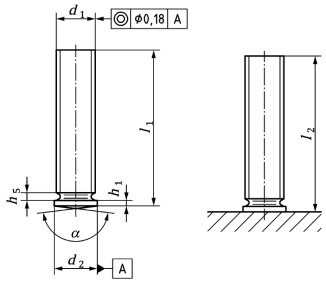
	Type	Material	Suitable for stud feeding	
			Manual	Automation[1)]
	PS Threaded studs with flange	A2-50	e.g. 	e.g. 

d_1	l_1+0,6	d_2±0.2	h_1	max. h_5	α±2°	
M5	see table	6.0	0.7 - 1.40	1.0	166°	
M6		7.0				
M8		9.0	0.80 - 1.40	1.5		

Diameter →

Length l_1 ↓

	M5	M6	M8
	Order No.	Order No.	Order No.
10 mm	12-55-010*	12-56-010*	--
12 mm	--	--	12-58-012*
15 mm	12-55-015*	12-56-015*	12-58-015*
16 mm	12-55-016*	12-56-016*	12-58-016*
20 mm	12-55-020*	12-56-020*	12-58-020*
25 mm	12-55-025*	12-56-025*	12-58-025*
30 mm	12-55-030*	12-56-030*	12-58-030*
35 mm	--	12-56-035*	12-58-035*
40 mm	--	12-56-040*	12-58-040*
Chuck	82-50-005	82-50-006	82-50-008
			
Chuck	83-51-005	83-51-006	83-51-008
			
Chuck	84-50-005	84-50-006	84-50-008
			

Further accessories see accessories catalogue

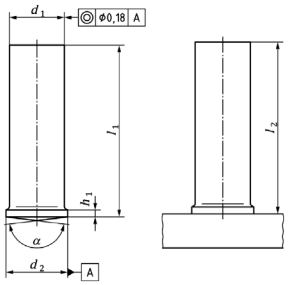
* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: M3 to M8 (M10 with modification only)
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

	Type	Material	Suitable for stud feeding	
			Manual	Automation[1)]
	US Unthreaded studs (pins) with flange*	Steel 4.8 copper coated (suitable for welding) A2-50	e.g. 	e.g. 

d_1±0.1	$l_{1\,min}$+0.6	d_2±0.2	h_1	α±2°
3	8	4	0.7 - 1.40	166°
4		5		
5	12	6		
6		7		
7.1	15	9	0.80 - 1.40	
8				



Diameter →

Material ↓	Ø 3 mm	Ø 4 mm	Ø 5 mm	Ø 6 mm	Ø 7.1 mm	Ø 8 mm
	Order No.	Order No.	Order No.	Order No.	Order No.	Order No.
Steel 4.8 copper coated (suitable for welding)	215-3-XXX	215-4-XXX	215-5-XXX	215-6-XXX	215-7-XXX	215-8-XXX
A2-50	225-3-XXX	225-4-XXX	225-5-XXX	225-6-XXX	225-7-XXX	225-8-XXX

Chuck	82-50-003	82-50-004	82-50-005	82-50-006	82-50-071	82-50-008
						
Chuck	83-51-003	83-51-004	83-51-005	83-51-006	83-51-071	83-51-008
						
Chuck	84-50-003	84-50-004	84-50-005	84-50-006	84-50-071	84-50-008
						

Further accessories see accessories catalogue

* Not in stock, minimum order quantity, delivery time and price upon request.
Please send us the article number with your request. In the article number "XXX" is to be replaced by the respective length (e.g. 025 for 25 mm).

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: 3 to 8 mm
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

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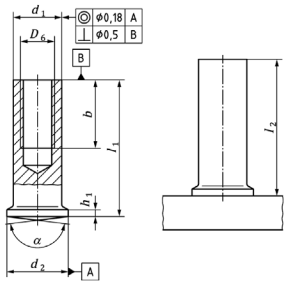
	Type	Material	Suitable for stud feeding	
			Manual	Automation[1)]
	IS Studs with internal thread and flange*	Steel 4.8 copper coated (suitable for welding) A2-50	e.g. 	e.g. 

D_6	$l_{1\,min}$ + 0.6	b_{min} +2P	d_2±0.2	d_1±0.1	h_1	α±2°	
M3	10	5	6.0	5.0	0.7 - 1.40	166°	
M4		6	7.0	6.0			
M5			9.0	7.1	0.80 - 1.40		
M5	15	7.5		8.0			
M6		9					

Diameter →

Material ↓	M3 / Ø 5 mm	M4 / Ø 6 mm	M5 / Ø 7.1 mm	M5 / Ø 8 mm	M6 / Ø 8 mm
	Order No.	Order No.	Order No.	Order No.	Order No.
Steel 4.8 copper coated (suitable for welding)	315-35-XXX	315-46-XXX	315-57-XXX	315-58-XXX	315-68-XXX
A2-50	325-35-XXX	325-46-XXX	325-57-XXX	325-58-XXX	325-68-XXX
Chuck	82-50-905	82-50-906	82-50-971	82-50-908	82-50-908
					
Chuck	83-51-005	83-51-006	83-51-071	83-51-008	83-51-008
					
Chuck	84-50-005	84-50-006	84-50-071	84-50-008	84-50-008
					

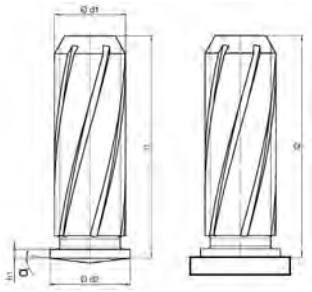
Further accessories see accessories catalogue

* Not in stock. Minimum order quantity, delivery time and price upon request.
Please send us the article number with your request. In the article number "XXX" is to be replaced by the respective length (e.g. 025 for 25 mm).

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For Automation: Diameter: 3 to 8 mm
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

	Type	Material	Suitable for stud feeding	
			Manual	Automation[2]
	SC Paint clearing threaded studs* [2]	Steel 4.8 copper coated (suitable for welding)	e.g. 	e.g. 

d_1	l_1 +0.6	d_2±0.2	d_4±0.08	l_3±0.05	h_1	α±1°	
M5	10 12 16	6.50	0,75	0.80	0.70 - 1.40	3°	
M6	20 25 30	7.50					
M8	12 16 20 25 30	9		0.85	0.80 - 1.40		

Diameter →

Material ↓	M5	M6	M8
	Order No.	Order No.	Order No.
Steel 4.8 copper coated (suitable for welding)	10-15-XXX	10-16-XXX	10-18-XXX
Chuck 	82-50-005 	82-50-006 	82-50-008 
Chuck 	84-50-005 	84-50-006 	84-50-008 

Further accessories see accessories catalogue

* Not in stock. Minimum order quantity, delivery time and price upon request.
Please send us the article number with your request. In the article number "XXX" is to be replaced by the respective length (e.g. 025 for 25 mm).

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For Automation: Diameter: M4 to M8
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

2) Similar to DIN EN ISO 13918

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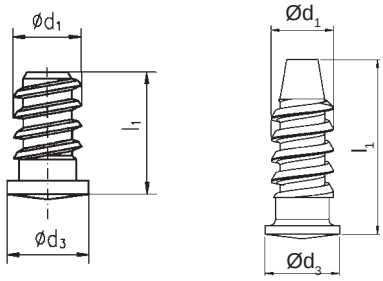
	Type	Material	Suitable for stud feeding	
			Manual	Automation[1]
	SC Fir tree studs[2]	Steel 4.8 copper coated (suitable for welding) A2-50	e.g. 	e.g. 

	d_1	l_1+0.6	d_1
S5:	5.0	9.0 14.2	6.0
S6:	6.0	18.0 25.0	7.0



without dogpoint with dogpoint

Diameter →

Material ↓	S5 x 9 mm	S5 x 14,2 mm	S5 x 18 mm	S5 x 25 mm	S6 x 18 mm	S6 x 25 mm
	Order No.	Order No.	Order No.	Order No.	Order No.	Order No.
Steel 4.8 copper coated (suitable for welding)	10-25-009**	10-25-014**	10-25-018	10-25-025	10-26-018*	10-26-025*
A2-50	10-45-009	--	--	--	--	--
Chuck	82-50-005	82-50-005	82-50-005	82-50-005	82-50-006	82-50-006
						
Chuck	84-50-005	84-50-005	84-50-005	84-50-005	84-50-006	84-50-006
						

Further accessories see accessories catalogue

* Not in stock, minimum order quantity, delivery time and price upon request.

** with dogpoint

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) For automation: Diameter: M4 to M8
Stud length: 8 to 40 mm (other lengths on request)
For more details, see accessories catalogue.

2) Similar to DIN EN ISO 13918

4

Welding process:

Capacitor discharge stud welding with tip ignition (CD)
Drawn arc stud welding (ARC)

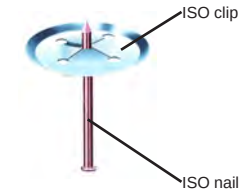
Welding elements type CD ISO cupped head pins

The welding geometry has a process-optimised design.

Especially suitable for welding through insulating mats in thin-sheet segment (e. g. fastening of heating, ventilation, air-conditioning and fire insulation mats HVAC).

Pin not insulated
from page 60

Pin insulated
from page 61



with ISO clip
(not included in delivery)

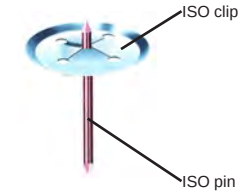
Welding elements type CD ISO nails

Name for an insulation nail. This nail is not standardised. The welding geometry is designed similar to DIN EN ISO 13918.

Especially suitable for the subsequent attachment of insulating mats in thin-sheet segment (e. g. fastenersing of heating, ventilation, air-conditioning and fire insulation mats HVAC).

4.8 copper coated
from page 62

A2-50
from page 63



with ISO clip
(not included in delivery)

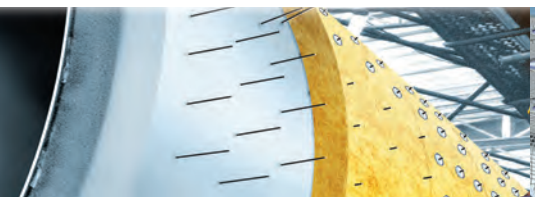
Welding elements type ND ARC ISO pins

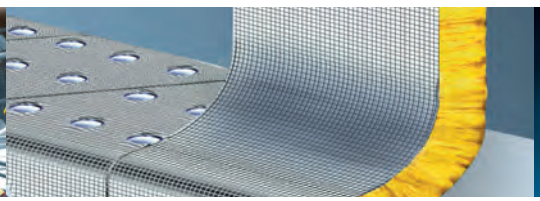
Name for an insulation pin according to DIN EN ISO 13918.

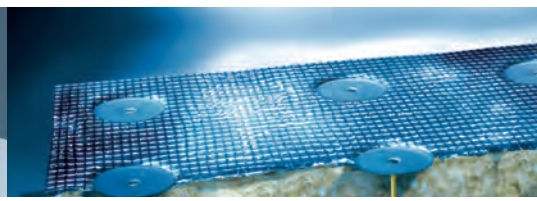
Especially suitable for the subsequent attachment of insulating mats (e. g. fire-resistant insulation FRI).

4.8 copper coated
from page 64

A2-50
from page 64



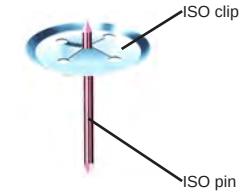




4

Welding process:

Capacitor discharge stud welding with tip ignition (CD)
Drawn arc stud welding (ARC)



with ISO pin
(not included in delivery)

ISO clips / nail protective caps

Insulation clips are necessary for securing the insulating mats.

Nail protective caps protect against injury.

from page 65

from page 66

from page 66

Welding elements of type CD bimetallic insulation pins (composite pins)

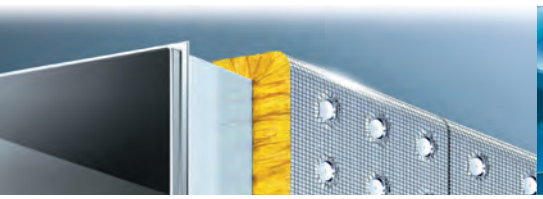
Composite pins consist of an aluminium blind hole bush with pressed-in pin.

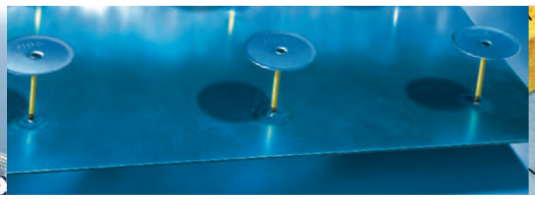
Especially suitable for insulation on an aluminium base material.

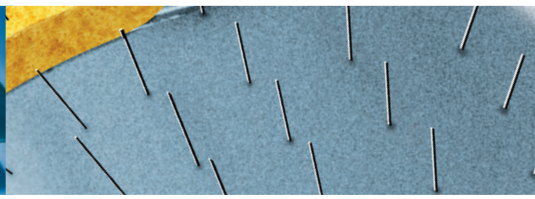
4.8 copper coated
from page 67

A2-50
from page 67

1.4571 (A4-50)
from page 67







4

Material combinations

according to DIN EN ISO 14555
(Select stud material in a way that material of the same kind is welded.)

Stud material	Base material			
	ISO/TR 15608 Groups 1 to 6, 11.1	ISO/TR 15608 Groups 1 to 6, 11.1 and galvanized and metal plated steel sheets, max. coating thickness 25 µm	ISO/TR 15608 Group 8	ISO/TR 15608 Groups 21 and 22
Steel 4.8[1)]	a	b	a	--
A2-50	a	b	a	--
EN AW-Al99,5	--	--	--	b
EN AW-AlMg3	--	--	--	a
Exemplification of welding suitability: -- non weldable a well suited for any application, e.g. power transmission b suitable, limitations with power transmission				

[1)] suitable for welding

Weldability tests of other material combinations upon request.

Welding elements with particular specifications available on request

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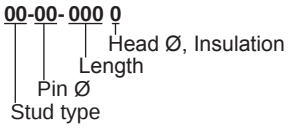
Order key for cupped head pins

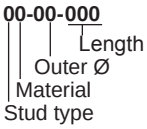


	Stud type
49	Cupped head pin

	Pin Ø
20	2.0 mm
27	2.7 mm

	Head Ø, Insulation
0	Head Ø 30 mm, not insulated
1	Head Ø 38 mm, not insulated
4	Head Ø 30 mm, pin, insulated
5	Head Ø 38 mm, pin, insulated

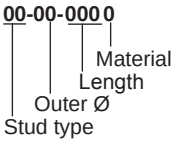
Order key for CD ISO nails



	Stud type
4	Insulation nail

	Material
1	Steel 4.8 copper coated
2	A2-50

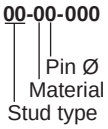
Order key for ARC ISO pins



	Stud type
79	Insulation pin

	Material
1	Steel 4.8 copper coated
2	A2-50

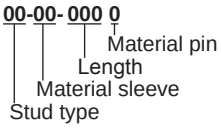
Order key for clips



	Stud type
49	Clip

	Material
1	Steel 4.8 galvanized
2	A2-50

Order key for bimetallic insulation pins (sleeve AlMg3)



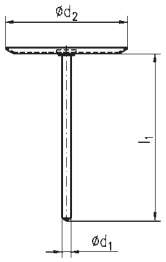
	Stud type
79	Bimetallic insulation pin

	Material
1	Steel 4.8 galvanized
2	A2-50
45	AlMg3 (sleeve)

Order examples:

Cupped head pin Ø 2 x 28, pin with insulation	**Order No.** 49-20-0284
CD ISO nails Ø 2 x 40, material: steel 4.8 copper coated	**Order No.** 41-02-040
ARC ISO pin Ø 3 x 40, material: steel 4.8 copper coated	**Order No.** 79-13-040 1
Clip Ø 38/Ø 2, four times slotted, material: steel 4.8 galvanized	**Order No.** 49-12-001A
Bimetallic insulation pin Ø 3 x 80, material pin: A2-50, material sleeve: AlMg3	**Order No.** 79-45-0802

	Type	Material	Suitable for stud feeding Manual
	ISO Cupped head pins (pin not insulated)	Pin: Mild steel 4.8 (suitable for welding) Head: Steel 4.8 galvanized	e.g. 

d_1	l_1	d_2	
2	see table	30	
2.7		38	

Details that are not defined are left to the manufacturer.

Diameter →

Length ↓	Ø 2 / Ø 30 mm Order-No.	Ø 2.7 / Ø 38 mm Order-No.
9.5 mm	49-20-0100	49-27-0101*
12.7 mm	49-20-0130*	49-27-0131*
19.1 mm	49-20-0190	49-27-0191*
22.2 mm	49-20-0220	49-27-0221*
25.4 mm	49-20-0250	49-27-0251*
28.6 mm	49-20-0290	49-27-0291*
34.9 mm	49-20-0350*	49-27-0351*
38.1 mm	49-20-0380	49-27-0381
41.3 mm	49-20-0410*	49-27-0411
47.6 mm	49-20-0480	49-27-0481
50.8 mm	49-20-0510	49-27-0511
54.0 mm	49-20-0540	49-27-0541*
63.5 mm	--	49-27-0641
73.0 mm	--	49-27-0731
76.2 mm	--	49-27-0761
89.9 mm	--	49-27-0891
101.6 mm	--	49-27-1011
152.4 mm	--	49-27-1511*
Chuck	82-50-310B	82-50-308A
		

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

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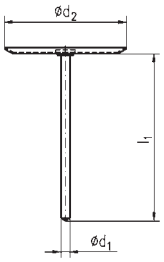
	**Type**	**Material**	Suitable for stud feeding Manual
	ISO Cupped head pins (pin insulated)	Pin: Mild steel 4.8 (suitable for welding) Head: Steel 4.8 galvanized	e.g. 

	d_1	l_1	d_2		
	2	see table	30		
	2.7		38		

Details that are not defined are left to the manufacturer.

Diameter →

Length ↓

	Ø 2 / Ø 30 mm	Ø 2.7 / Ø 38 mm
	Order No.	Order No.
9.5 mm	49-20-0104*	49-27-0105*
12.7 mm	49-20-0134*	49-27-0135*
19.1 mm	49-20-0194A	49-27-0195*
22.2 mm	49-20-0224	49-27-0225*
25.4 mm	49-20-0254	49-27-0255*
28.6 mm	49-20-0284	49-27-0295*
34.9 mm	49-20-0354*	49-27-0355*
38.1 mm	49-20-0384A	49-27-0385*
41.3 mm	49-20-0414*	49-27-0415*
47.6 mm	49-20-0474	49-27-0485*
50.8 mm	49-20-0514	49-27-0515*
54.0 mm	49-20-0544	49-27-0545*
63.5 mm	--	49-27-0645
73.0 mm	--	49-27-0735
76.2 mm	--	49-27-0765
89.9 mm	--	49-27-0895
101.6 mm	--	49-27-1015
152.4 mm	--	49-27-1515*
Chuck	82-50-310B	82-50-308A
		

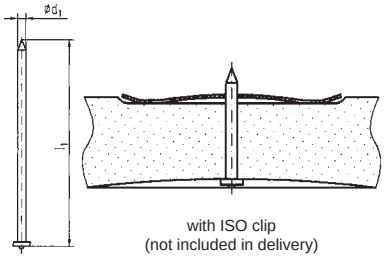
Minimum order quantity, delivery time and price upon request.

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

	Type	Material	Suitable for stud feeding
	CD ISO Nails	Steel 4.8 copper coated (suitable for welding)	Manual e.g. 

d_1±0.1	l_1
2	see table
2.6	
3	



with ISO clip
(not included in delivery)

Details that are not defined are left to the manufacturer.

Diameter →

Length ↓

	Ø 2 mm	Ø 2.6 mm	Ø 3 mm
	Order No.	Order No.	Order No.
20 mm	41-02-020*	41-26-020*	--
30 mm	41-02-030*	41-26-030	41-03-030*
40 mm	41-02-040*	--	41-03-040*
50 mm	41-02-050*	--	41-03-050*
60 mm	41-02-060*	41-26-060*	41-03-060*
65 mm	41-02-065*	--	--
70 mm	41-02-070*	--	41-03-070*
80 mm	41-02-080*	--	41-03-080*
90 mm	41-02-090*	--	41-03-090*
100 mm	41-02-100*	--	41-03-100*
Chuck	82-50-020	82-50-027	82-50-030
			

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

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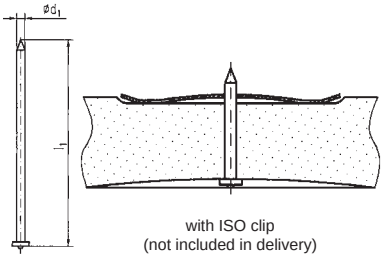
	Type	Material	Suitable for stud feeding
	CD ISO Nails	A2-50	Manual e.g. 

	d_1±0.1	l_1		
	2	see table		
	2.6			
	3			



with ISO clip
(not included in delivery)

Details that are not defined are left to the manufacturer.

Diameter →

Length ↓	Ø 2 mm	Ø 2.6 mm	Ø 3 mm
	Order No.	Order No.	Order No.
20 mm	42-02-020*	--	--
30 mm	42-02-030*	--	42-03-030*
40 mm	42-02-040*	--	42-03-040*
50 mm	42-02-050*	--	42-03-050*
60 mm	42-02-060*	--	42-03-060*
65 mm	42-02-065*	--	--
70 mm	42-02-070*	--	42-03-070*
80 mm	42-02-080*	--	42-03-080*
90 mm	42-02-090*	--	42-03-090*
100 mm	42-02-100*	--	42-03-100*
Chuck	82-50-020	82-50-027	82-50-030
			

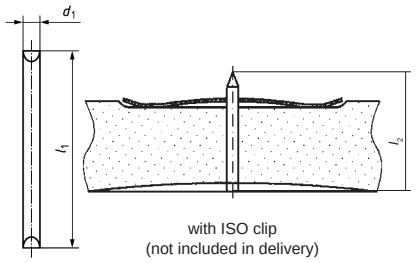
Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

	Type	Material	Suitable for stud feeding
	ARC ISO Pins*	Steel 4.8 copper coated (suitable for welding) A2-50	Manual e.g. 

d_1 ±0,1	l_1	l_2 + 1 [2]
3	l_2 + 3	25 to 300
4		25 to 500
5		25 to 500
6[1]		25 to 500



with ISO clip
(not included in delivery)

Details that are not defined are left to the manufacturer.

Diameter

Material	Ø 3 mm Order No.	Ø 4 mm Order No.	Ø 5 mm Order No.	Ø 6 mm [1] Order No.
Steel 4.8 copper coated (suitable for welding)	79-13-XXX 1	79-14-XXX 1	79-15-XXX 1	79-16-XXX 1
A2-50	79-13-XXX 2	79-14-XXX 2	79-15-XXX 2	79-16-XXX 2
Chuck for ISO pins up to L = 110 mm	80-04-959	80-04-960	80-04-961	80-04-962
				
Chuck for ISO pins from L = 110 mm	80-05-452	80-05-513	80-04-956	80-04-957
				

Further accessories see accessories catalogue

* Not in stock. Minimum order quantity, delivery time and price upon request.
Please send us the article number with your request. In the article number “XXX” is to be replaced by the respective length (e.g. 025 for 25 mm).

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) Similar to DIN EN ISO 13918

2) The length after welding l_2 is a rated value.

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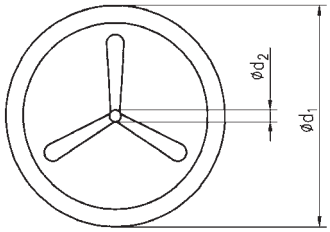
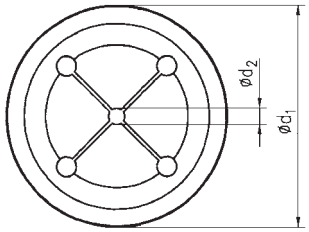
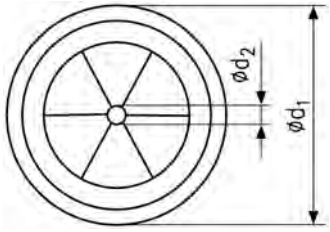
Type	Material	Suitable for stud feeding
		Manual
Clips / Nail protection caps	Steel 4.8 galvanized A2-50	e.g. 



3 slots [1)]



4 slots [1)]



6 slots [1)]

Details that are not defined are left to the manufacturer.

Diameter →

Material	Ø 38 / Ø 2	Number of Slots	Ø 38 / Ø 3	Number of Slots	Ø 38 / Ø 4	Number of Slots	Ø 38 / Ø 5	Number of Slots
	Order No.		Order No.		Order No.		Order No.	
Steel 4.8 galvanized (suitable for welding)	49-12-001 49-12-001A	6 4	49-13-001 49-13-001A	6 3	49-14-001	3	49-15-001	3
A2-50	49-22-001A 49-22-001C	4 6	49-23-001	3	49-24-001	3	49-25-001	3

Diameter →

Material	Ø 30 / Ø 2	Number of Slots	Ø 30 / Ø 3	Number of Slots	Ø 30 / Ø 4	Number of Slots	Ø 30 / Ø 5	Number of Slots
	Order No.		Order No.		Order No.		Order No.	
Steel 4.8 galvanized (suitable for welding)	--		--		--		--	
A2-50	49-22-001	6	--		--		--	

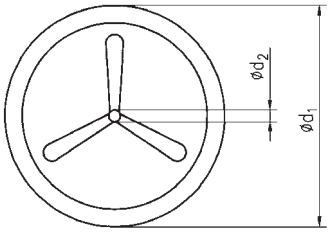
Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

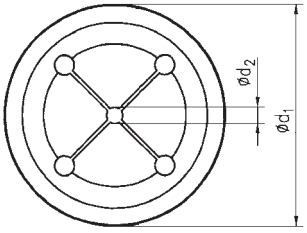
Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

1) The multiple slot increases the even distribution and reduces the tilting of the clips.

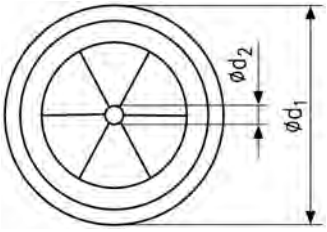
	Type	Material	Suitable for stud feeding Manual
	Clips / Nail protection caps	Steel 4.8 galvanized A2-50	e.g. 



3 slots [1)]



4 slots [1)]



6 slots [1)]

Details that are not defined are left to the manufacturer.

Diameter →

Material ↓	Ø 38 / Ø 2	Number of Slots	Ø 38 / Ø 3	Number of Slots	Ø 38 / Ø 4	Number of Slots	Ø 30 / Ø 5	Number of Slots
	Order No.		Order No.		Order No.		Order No.	
Steel 4.8 galvanized with plastic cap	49-12-005	3	49-13-005	3	49-14-005	3	--	

Further accessories see accessories catalogue

Length →

Material ↓	9 mm	14 mm
	Order No.	Order No.
plastic	47-82-001	47-83-001

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

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1) The multiple slot increases the even distribution and reduces the tilting of the clips.

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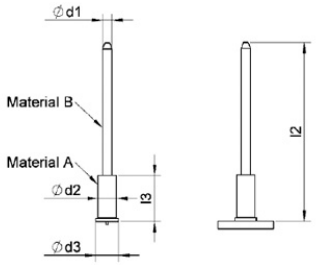
Type	Suitable for stud feeding
Bimetallic insulation pins*	Manual

d_1	d_2	l_2	Material A (sleeve)	Material B (pin)
Ø 3	Ø 6	see table	AlMg3	see table



Details that are not defined are left to the manufacturer.

Length

Material B	50 mm Order No.	60 mm Order No.	70 mm Order No.	80 mm Order No.
Steel 4.8 (suitable for welding)	79-45-0501*	79-45-0601*	79-45-0701*	79-45-0801*
A2-50	79-45-0502*	79-45-0602*	79-45-0702*	79-45-0802*
1.4571 (A4-50)	79-45-0504*	79-45-0604*	79-45-0704*	79-45-0804*
Chuck for insulation pins (with backstop)	80-04-959	80-04-959	80-04-959	80-04-959

Further accessories see accessories catalogue

* Not in stock, minimum order quantity, delivery time and price upon request.

Custom dimensions are not listed in the table – HBS manufactures customised welding elements. On request we can provide pricing.

5

Welding process:

MARC Welding with magnetically positioned light arc

MARC welding nuts type Hex^{Nut}

Name for a hexagon nut according to HBS guidelines

A2-50

from page 70

60-06-0082
60-08-0082A
60-10-0092
60-12-0112

Further round and hexagonal nuts on request

Stud types, abbreviations, materials, standards, mechanical characteristics

Materials
The strength of connection parts and, therefore, the mechanical properties of these parts are decisive factors for the user. On the other hand, some applications are subject to increased demands with respect to the optical quality of weld seams as well as more stringent requirements regarding pressure and gas tightness. These properties are not only determined by the welding process but also by the material used.
Nuts and sleeves made of non-rusting stainless steel (A2, A4) have a considerably higher process and functional reliability as well as a longer service life compared to standard steel.

Hexagon nut acc. to DIN 934 / ISO 4032 (A2, A4)
Owing to their geometrical design, these hexagon nuts are suitable for simple fastening tasks. The hexagon nut to DIN 934 only partly takes into account constructional component requirements such as centring and thread consistency as well as the effects of the welding process.

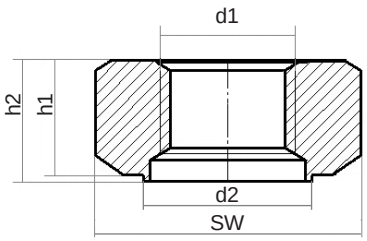
HBS welding nut type Hex^{Nut} (A2-50)
Unlike the hexagon nut to DIN 934 / ISO 4032, the HBS welding nut type Hex^{Nut} has been adapted to the demands of the MARC process. The constructional design features of the HBS welding nut type Hex^{Nut} take into account the ability to centre on through holes as well as continuous smooth threading for all recommended bore diameters. The constructional design of the geometry of the welding element enables a weld seam to be formed which is both pressure-tight and impervious to gas.

Thread
Threads comply with DIN ISO 724, tolerance 6g.

Welding elements with particular specifications available on request

	Type	Material	Suitable for stud feeding
	MARC Welding nuts type Hex[Nut]	A2-50	Manual e.g. 

WAF	d1	d2 $^{-0,1}$ in mm	suitable for d_{hole} $^{+0,1 \ldots +0,4}$ in mm	h1 in mm	h2 in mm
14	M6	10.5	10.6	7.5	8
14	M8	10.5	10.6	7.5	8
17	M10	12.5	12.6	8.5	9
19	M12	14.8	14.9	10.5	11



Diameter →

Material ↓	M6	M8	M10	M12
	Order No.	Order No.	Order No.	Order No.
A2-50	60-06-0082*	60-08-0082A*	60-10-0092*	60-12-0112*
Sleeve fixture	88-22-532	88-21-107	88-21-108	88-21-109
				

Further accessories see accessories catalogue

* Minimum order quantity, delivery time and price upon request.

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Welding elements for special applications – examples

SC collar / large flange studs with plastic cap

The plastic cap provides protection against mechanical stress, e.g. impacts, and means that the stud does not need to be covered manually prior to painting work.


10-70-825*

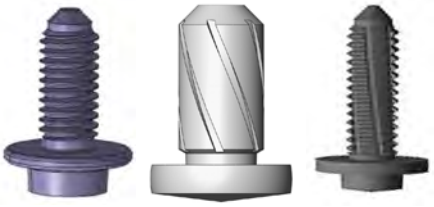

10-70-815*


10-70-612W*

T studs

The welding element named after its geometry is welded to the cylindrical shaft. By inserting and engaging, fastening elements made of plastic or metal (e.g. clips, clamps or trim strips) can be locked and guided on the head of the stud. The dimensions of the T stud allow low installation heights and high pull-off forces.


10-23-054*



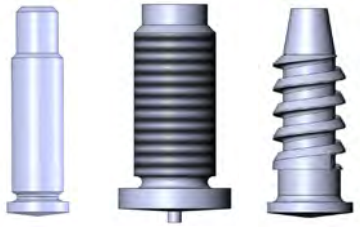
Large flange studs (with and without paint clearing)

The large flange permits high torque loads to be transmitted. Transverse grooves (paint clearing grooves) in the thread allow excess paint to run off during painting. When the nut is screwed on after painting, the transverse grooves help remove the excess, dried paint.


14-56-0185Z*


11-56-013LZ*


10-16-2017Z*



Welding elements with dogpoint

The end of the stud can be designed as a so-called dogpoint – a short or long trunnion with flat tip (in compliance with DIN 78, type SD and type LD). This trunnion with reduced shaft diameter serves as a locating aid for the nut which is to be attached, especially in the case of automatic nut feeders.


12-55-020Z*


12-04-010Z*


10-25-014*

ARC break-off pins

The geometrical design of a stud as a break-off pin enables comparatively short welding elements to be welded onto components.
Extension of the stud allows the stud to be fixed securely in the chuck and a ceramic ferrule to be fed. After welding, the fixing element which is no longer required can be removed by snapping off.


10-08-05020*

Welding elements for special applications – examples

ARC SC Fir tree studs (special geometry)

40-25-0155A*

SC threaded stud with reduced flange diameter (mini flange)

19-55-010M

UT pins for special applications

12-88-19680

Refractory anchors / ARC fixing pins (Fiberfix) / ARC flat anchors

79-36-0504*

79-25-1002*

79-56-0252*

Balls

Ø 4: 10-20-004*

Ø 5: 10-20-005*

Ø 6: 10-20-006*

* Minimum order quantity, delivery time and price upon request.

Please do not hesitate to contact us with queries concerning welding elements for your specific application.

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Our device technology is, of course, completely – from in-house development to production –

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Welding Elements Catalogue