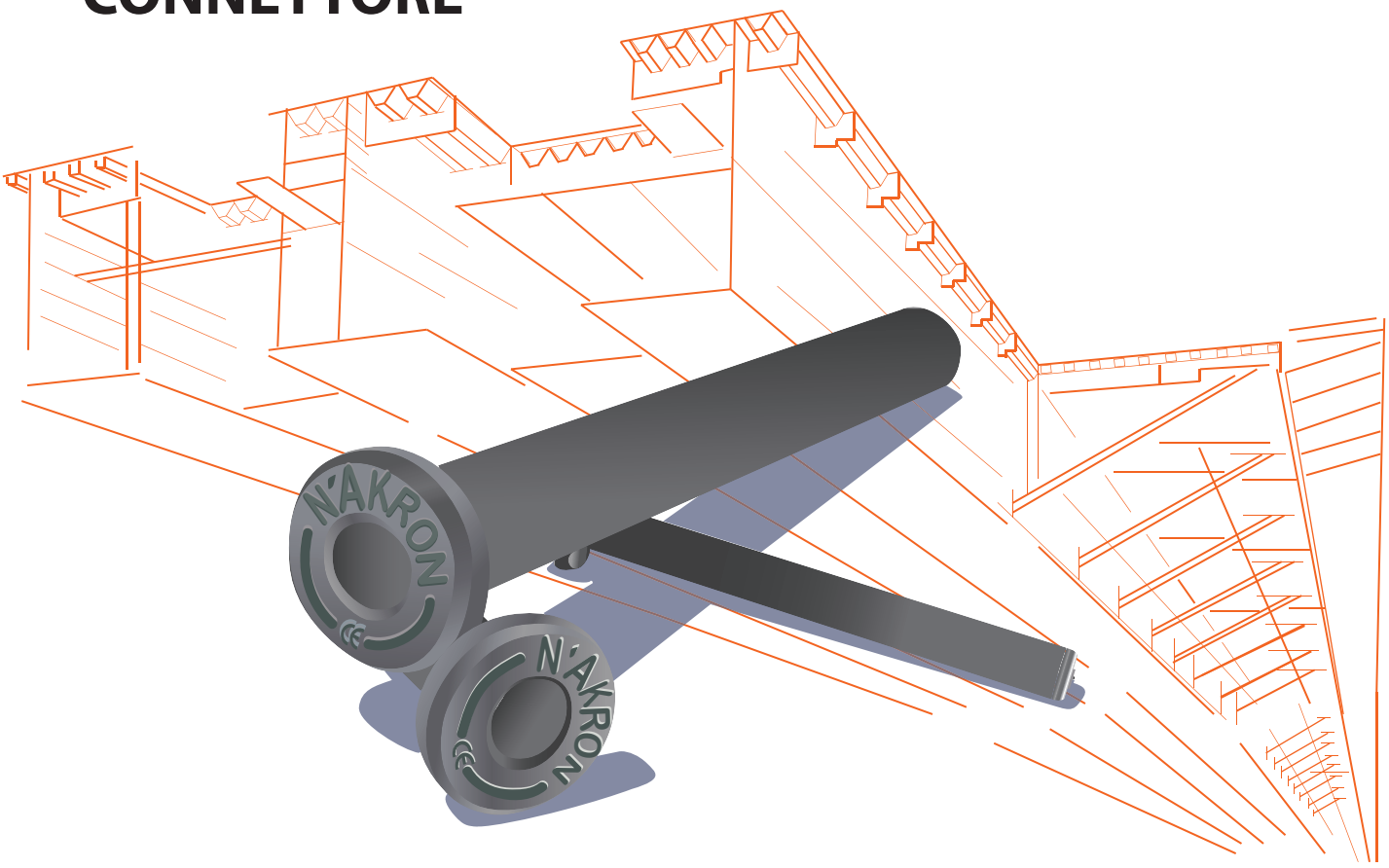
SHEAR CONNECTOR N'AKRON SD1 - A
UNE - EN ISO 13918:2008
SHEAR CONNECTOR N'AKRON TYP - B
ANSI - AWS D1.1/D1.1M:2010

SHEAR CONNECTOR SD1 - A
CONECTOR SD1 - A
WELDING STUD
KOŁEK N'AKRON
CONECTORES DE ANCORAGEM
GOUJON D'ANCRAGE
CONNETTORE



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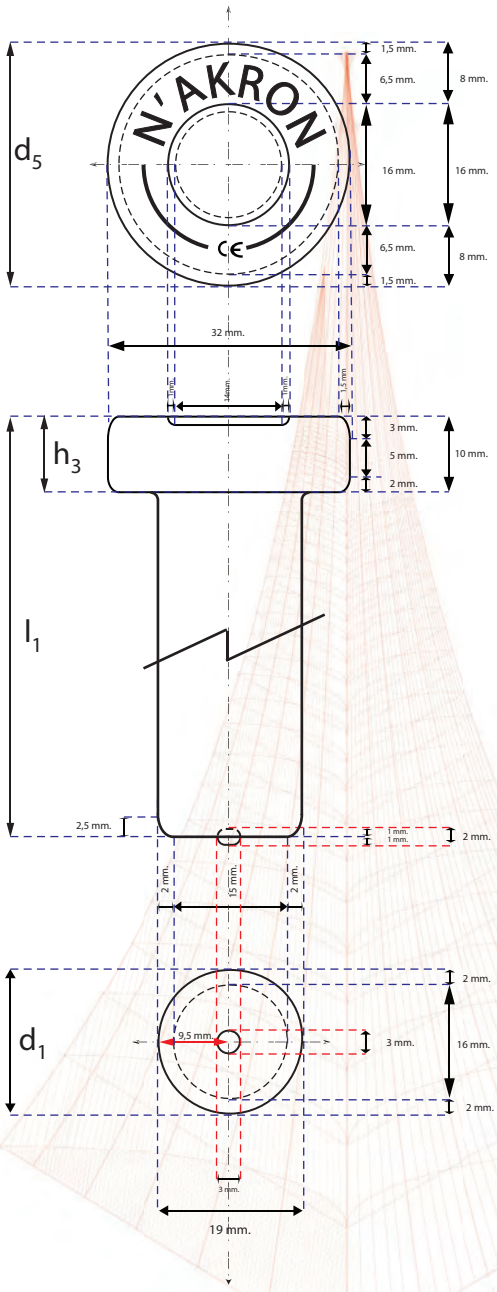

N'AKRON SD1-A SHEAR CONNECTOR

Device used to solidarize the steel and the concrete all in one piece .

Are metal, cylindrical acting as anchors in the concrete against the tensile stress , efforts transmitted to the concrete by adhesion or by contact pressure , depending on the type of construction .

In addition to this basic issue it must perform other functions such as:

- Rule out the possibility of brittle fracture that can occur when the separation is excessive;
- Ensure the joint between the concrete and the metal profile without considering other factors such as adhesion, friction, etc. , Whose potential loss could also lead to brittle fracture ;
- Allow the application of direct charges on the metallic element safely take-off between concrete and steel;
- Prevent the connection to be entirely in the tensioned concrete area , avoiding fisuration ;
- Ensure the transmission capacity by a possible inverted sign of the flush efforts ;
- Establish adequate correlation between the calculation and behavior of the part during tough process .

Welded technic by arc welding with ceramic ferrule or tempering gas protection.

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N'AKRON SD1-A SHEAR CONNECTOR

The geometry , dimensions and tolerances of the N'AKRON SD1-A connectors are represented in the accompanying figures. The shape of the base is slightly concave with rounded edges - A and is finished with flux in the form of aluminum ball fixed by pressure, which, when arc melt , it cleans and deoxidize the surface area of the metal base . The dimensions of the ceramic ferrules which are used as auxiliary element for welding are designated below . The connectors are manufactured a nd dimensioned according to the European standard E N ISO 13918:2008

The material used to manufacture is steel group 1 , according to the UNE- CEN ISO / TR 15608 IN ,the cluster of steel and the limits are in Tables

CHEMICAL COMPOSITION

Group	Type of steel											
1	Steels with a yield.P specified minimum $R_{eh} \leq 450$ N/mm² and analysis in %											
	C	Si	Mn	Mo	S	P	Cu	Ni	Cr	Nb	V	Ti
	≤ 0,25	≤ 0,60	≤ 1,8	≤ 0,70 [b]	≤ 0,045	≤ 0,045	≤ 0,40 [b]	≤ 0,5 [b]	≤ 0,3	≤ 0,06	≤ 0,1 [b]	≤ 0,05

Data chart 1.1

LIMITS

C ≤ 0,2%[a]	CEV ≤ 0,35[a]	Al ≥ 0,02%[a,b]

[a] Casting analysis value.

Data chart 1.2

MECHANICAL PROPERTIES

Tensile strength	Yield strength	Elongation
$R_m \geq 450$ N/mm²	$R_{eH} \geq 350$ N/mm²	$A_5 \geq 15\%$

Data chart 1.3

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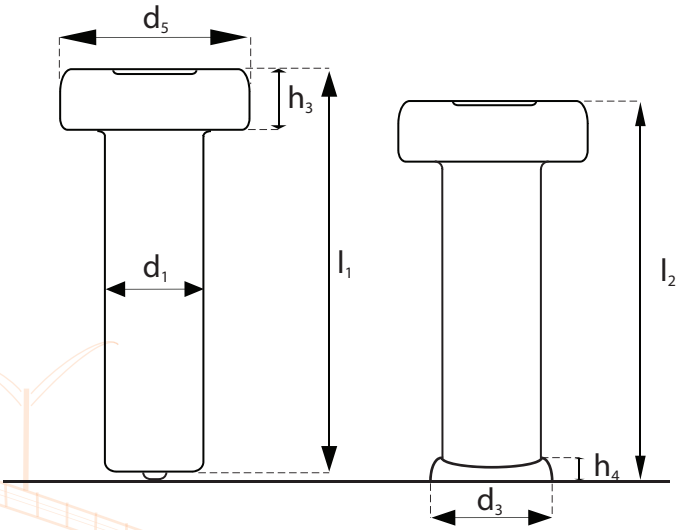
LBW LAW



Symbols and abbreviations

d_1	Nominal diameter
d_3	Welded collar diameter
d_5	Head diameter
l_1	Total connector length (Without aluminium pin)
l_2	Nominal connector length
h_3	Head connector high
h_4	Welded collar high
LBW	Long before welding
LAW	long after welding

STUD MEASURE AND TOLERANCES 10 -13 MM

d_1		l_2		l_1		d_5		h_3	
Nominal Ø		Length before welding		Length after welding		Head Ø		Head height	
Standard	Tolerance	Standard	Tolerance	Standard	Tolerance	Standard	Tolerance	Standard	Tolerance
10	- 0,4	Nominal length	+1, - 2	$l_2 + 3$	± 1,5	19	± 0,3	7	+1, - 0,5
10	9,6~10,0	50	48~51	53	51,5~54,5	19	18,7~19,3	7	6,5~8,0
10	9,6~10,0	75	73~76	78	76,5~79,5	19	18,7~19,3	7	6,5~8,0
10	9,6~10,0	100	98~101	103	101,5~104,5	19	18,7~19,3	7	6,5~8,0
10	9,6~10,0	125	123~126	128	126,5~129,5	19	18,7~19,3	7	6,5~8,0
10	9,6~10,0	150	148~151	153	151,5~154,5	19	18,7~19,3	7	6,5~8,0
10	9,6~10,0	175	173~176	178	176,5~179,5	19	18,7~19,3	7	6,5~8,0
Standard	Tolerance	Standard	Tolerance	Standard	Tolerance	Standard	Tolerance	Standard	Tolerance
13	- 0,4	Nominal length	+1, - 2	$l_2 + 3$	± 1,5	25	± 0,3	8	+1, - 0,5
13	12,6~13,0	50	48~51	53	51,5~54,5	25	24,7~19,3	8	7,5~9,0
13	12,6~13,0	75	73~76	78	76,5~79,5	25	24,7~19,3	8	7,5~9,0
13	12,6~13,0	100	98~101	103	101,5~104,5	25	24,7~19,3	8	7,5~9,0
13	12,6~13,0	125	123~126	128	126,5~129,5	25	24,7~19,3	8	7,5~9,0
13	12,6~13,0	150	148~151	153	151,5~154,5	25	24,7~19,3	8	7,5~9,0
13	12,6~13,0	175	173~176	178	177,5~179,5	25	24,7~19,3	8	7,5~9,0
13	12,6~13,0	200	198~201	203	201,5~204,5	25	24,7~19,3	8	7,5~9,0

Data chart 1.5 - 4

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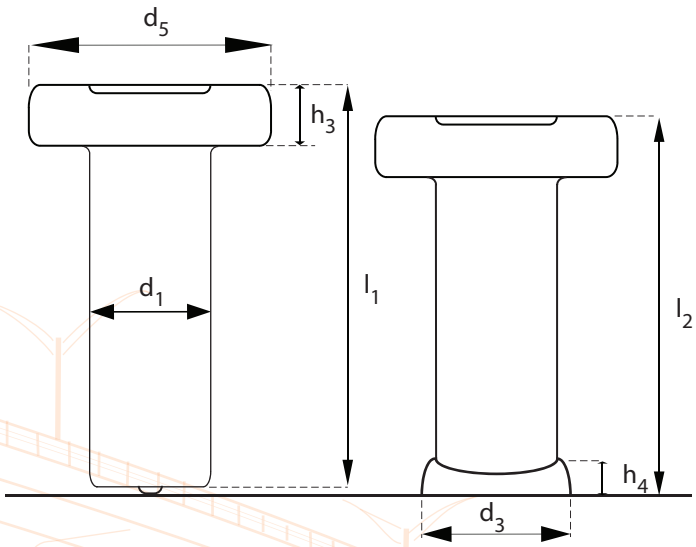
LBW LAW

Symbols and abbreviations

d_1	Nominal diameter
d_3	Welded collar diameter
d_5	Head diameter
l_1	Total connector length (Without aluminium pin)
l_2	Nominal connector length
h_3	Head connector high
h_4	Welded collar high
LBW	Long before welding
LAW	long after welding



STUD MEASURE AND TOLERANCES 16 MM

d_1		l_2		l_1		d_5		h_3	
Nominal Ø		Lengt before welding		Length after welding		Head Ø		Head height	
Standard	Tolerance	Standard	Tolerance	Standard	Tolerance	Standard	Tolerance	Standard	Tolerance
16	- 0,4	Nominal length	+1, - 2	$l_2 + 4$	± 1,5	32	± 0,3	8	+1, - 0,5
16	15,6~16,0	50	48~51	54	52,5~55,5	32	31,7~32,3	8	7,5~9,0
16	15,6~16,0	75	73~76	79	77,5~80,5	32	31,7~32,3	8	7,5~9,0
16	15,6~16,0	100	98~101	104	102,5~105,5	32	31,7~32,3	8	7,5~9,0
16	15,6~16,0	125	123~126	129	127,5~130,5	32	31,7~32,3	8	7,5~9,0
16	15,6~16,0	150	148~151	154	152,5~155,5	32	31,7~32,3	8	7,5~9,0
16	15,6~16,0	175	173~176	179	177,5~180,5	32	31,7~32,3	8	7,5~9,0
16	15,6~16,0	200	198~201	204	202,5~205,5	32	31,7~32,3	8	7,5~9,0
16	15,6~16,0	225	223~226	229	227,5~230,5	32	31,7~32,3	8	7,5~9,0
16	15,6~16,0	250	248~251	254	252,5~255,5	32	31,7~32,3	8	7,5~9,0

Data chart 1.6

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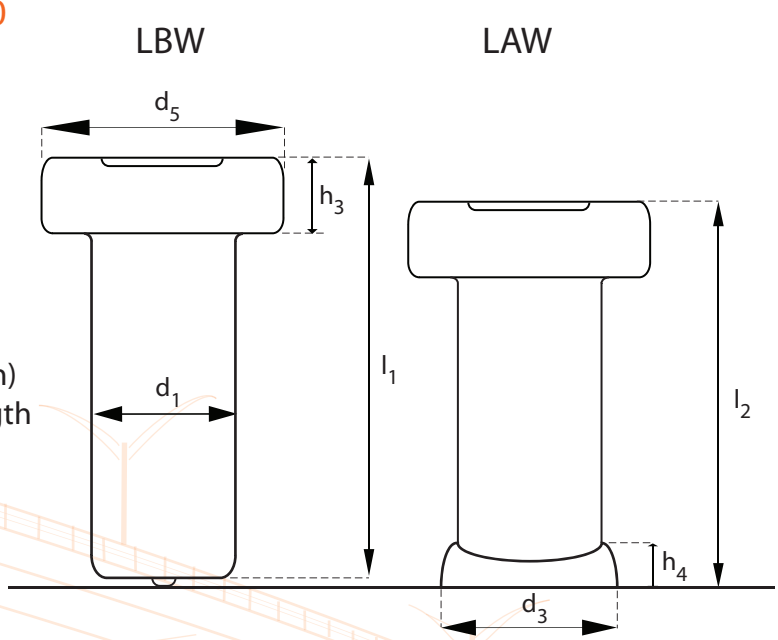
Symbols and abbreviations

d_1	Nominal diameter
d_3	Welded collar diameter
d_5	Head diameter
l_1	Total connector length (Without aluminium pin)
l_2	Nominal connector length
h_3	Head connector high
h_4	Welded collar high
LBW	Long before welding
LAW	long after welding



STUD MEASURE AND TOLERANCES 19 MM

d_1		l_2		l_1		d_5		h_3	
Nominal Ø		Length before welding		Length after welding		Head Ø		Head height	
Standard	Tolerance	Standard	Tolerance	Standard	Tolerance	Standard	Tolerance	Standard	Tolerance
19	- 0,4	Nominal length	+1, - 2	$l_2 + 4,5$	± 1,5	32	± 0,3	10	+1, - 0,5
19	18,6~19,0	50	48~51	54,5	53,0~56,0	32	31,7~32,3	10	9,5~11
19	18,6~19,0	75	73~76	79,5	78,0~81,0	32	31,7~32,3	10	9,5~11
19	18,6~19,0	100	98~101	104,5	103,0~106,0	32	31,7~32,3	10	9,5~11
19	18,6~19,0	125	123~126	129,5	128,0~131,0	32	31,7~32,3	10	9,5~11
19	18,6~19,0	150	148~151	154,5	153,0~156,0	32	31,7~32,3	10	9,5~11
19	18,6~19,0	175	173~176	179,5	178,0~181,0	32	31,7~32,3	10	9,5~11
19	18,6~19,0	200	198~201	204,5	203,0~206,0	32	31,7~32,3	10	9,5~11
19	18,6~19,0	225	223~226	229,5	228,0~231,0	32	31,7~32,3	10	9,5~11
19	18,6~19,0	250	248~251	254,5	253,0~256,0	32	31,7~32,3	10	9,5~11
19	18,6~19,0	275	273~276	279,5	278,0~281,0	32	31,7~32,3	10	9,5~11
19	18,6~19,0	300	298~301	304,5	303,0~306,0	32	31,7~32,3	10	9,5~11
19	18,6~19,0	325	323~326	329,5	328,0~331,0	32	31,7~32,3	10	9,5~11
19	18,6~19,0	350	348~351	354,5	353,0~356,0	32	31,7~32,3	10	9,5~11

Data chart 1.7

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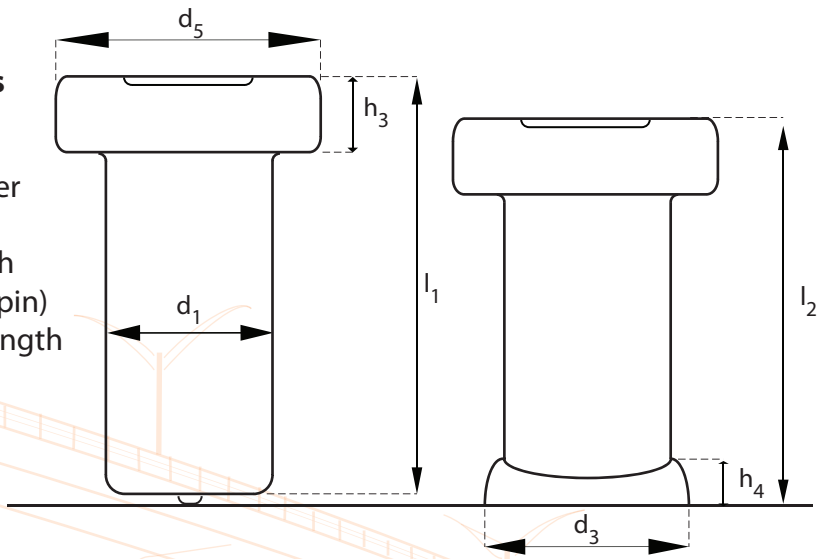
LBW

LAW

Symbols and abbreviations

d_1	Nominal diameter
d_3	Welded collar diameter
d_5	Head diameter
l_1	Total connector length (Without aluminium pin)
l_2	Nominal connector length
h_3	Head connector high
h_4	Welded collar high
LBW	Long before welding
LAW	long after welding



STUD MEASURE AND TOLERANCES 22 MM

d_1		l_2		l_1		d_5		h_3	
Nominal Ø		Length before welding		Length after welding		Head Ø		Head height	
Standard	Tolerance	Standard	Tolerance	Standard	Tolerance	Standard	Tolerance	Standard	Tolerance
22	- 0,4	Nominal length	+1, - 2	$l_2 + 5$	± 1,5	35	± 0,3	10	+1, - 0,5
22	21,6~22,0	50	48~51	55	53,5~56,5	35	34,7~35,3	10	9,5~11
22	21,6~22,0	75	73~76	80	78,5~81,5	35	34,7~35,3	10	9,5~11
22	21,6~22,0	100	98~101	105	103,5~106,5	35	34,7~35,3	10	9,5~11
22	21,6~22,0	125	123~126	130	128,5~131,5	35	34,7~35,3	10	9,5~11
22	21,6~22,0	150	148~151	155	153,5~156,5	35	34,7~35,3	10	9,5~11
22	21,6~22,0	175	173~176	180	178,5~181,5	35	34,7~35,3	10	9,5~11
22	21,6~22,0	200	198~201	205	203,5~206,5	35	34,7~35,3	10	9,5~11
22	21,6~22,0	225	223~226	230	228,5~231,5	35	34,7~35,3	10	9,5~11
22	21,6~22,0	250	248~251	255	253,5~256,5	35	34,7~35,3	10	9,5~11
22	21,6~22,0	275	273~276	280	278,5~281,5	35	34,7~35,3	10	9,5~11
22	21,6~22,0	300	298~301	305	303,5~306,5	35	34,7~35,3	10	9,5~11
22	21,6~22,0	325	323~326	330	328,5~331,5	35	34,7~35,3	10	9,5~11
22	21,6~22,0	350	348~351	355	353,5~356,5	35	34,7~35,3	10	9,5~11

Data chart 1.8

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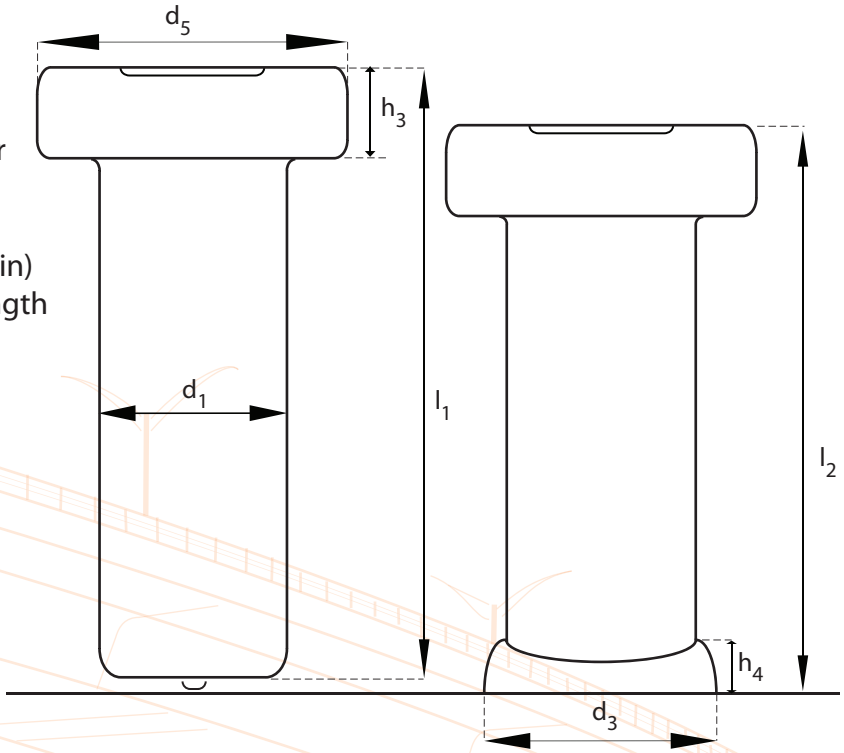
Symbols and abbreviations

d_1	Nominal diameter
d_3	Welded collar diameter
d_5	Head diameter
l_1	Total connector length (Without aluminium pin)
l_2	Nominal connector length
h_3	Head connector high
h_4	Welded collar high
LBW	Long before welding
LAW	long after welding

LBW LAW



STUD MEASURE AND TOLERANCES 25 MM

d_1		l_2		l_1		d_5		h_3	
Nominal Ø		Length before welding		Length after welding		Head Ø		Head height	
Standard	Tolerance	Standard	Tolerance	Standard	Tolerance	Standard	Tolerance	Standard	Tolerance
25	- 0,4	Nominal length	+1, - 2	l_2 + 5,5	± 1,5	41	± 0,3	12	+1, - 0,5
25	24,6~25,0	75	73~76	80,5	79,0~82,0	41	40,7~41,3	12	11,5~13,0
25	24,6~25,0	100	98~101	105,5	104,0~107,0	41	40,7~41,3	12	11,5~13,0
25	24,6~25,0	125	123~126	130,5	129,0~132,0	41	40,7~41,3	12	11,5~13,0
25	24,6~25,0	150	148~151	155,5	154,0~157,0	41	40,7~41,3	12	11,5~13,0
25	24,6~25,0	175	173~176	180,5	179,0~182,0	41	40,7~41,3	12	11,5~13,0
25	24,6~25,0	200	198~201	205,5	204,0~207,0	41	40,7~41,3	12	11,5~13,0
25	24,6~25,0	225	223~226	230,5	229,0~232,0	41	40,7~41,3	12	11,5~13,0
25	24,6~25,0	250	248~251	255,5	254,0~257,0	41	40,7~41,3	12	11,5~13,0
25	24,6~25,0	275	273~276	280,5	279,0~282,0	41	40,7~41,3	12	11,5~13,0
25	24,6~25,0	300	298~301	305,5	304,0~307,0	41	40,7~41,3	12	11,5~13,0
25	24,6~25,0	325	323~326	330,5	329,0~332,0	41	40,7~41,3	12	11,5~13,0
25	24,6~25,0	350	348~351	355,5	354,0~357,0	41	40,7~41,3	12	11,5~13,0

Data chart 1.9

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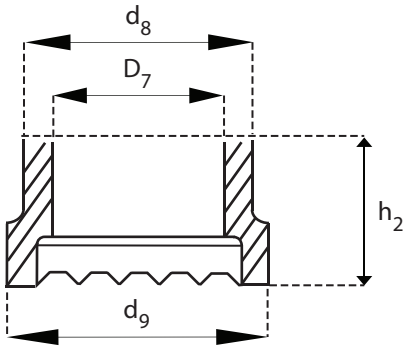
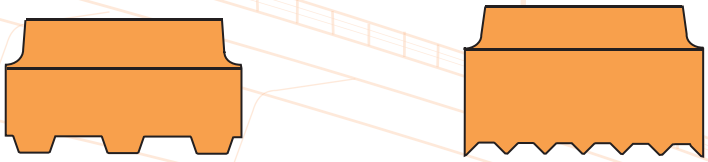
Symbols and abbreviations

D_7	Nominal ceramic ferrule diameter
d_8	Fastening diameter
d_9	Base ceramic ferule diameter
h_2	Ceramic ferule height





GALVANIZED **STEEL**

CERAMIC MEASURES FOR WELDING STUDS - SD1

TIPO	D_7		d_8		d_9		h_2	
	Standard	Tolerance +0,5	Standard	Tolerance ±1	Standard	Tolerance ±1	Standard	Tolerance ≈
UF10	10,2	10,7	15	14,0~16,0	17,8	16,8~18,8	10,0	≈
UF13	13,1	13,6	20	19,0~21,0	22,2	21,2~23,2	11,0	≈
UF16	16,3	16,8	26	25,0~27,0	30,0	29,0~31,0	13,0	≈
UF19	19,4	19,9	26	25,0~27,0	30,8	29,8~31,8	16,7	≈
UF22	22,8	23,3	30,7	29,7~31,7	38,5	37,5~39,5	18,5	≈
UF25	26,0	26,4	35,5	34,5~36.5	41,0	40,0~42,0	21,0	≈

Data chart 1.10

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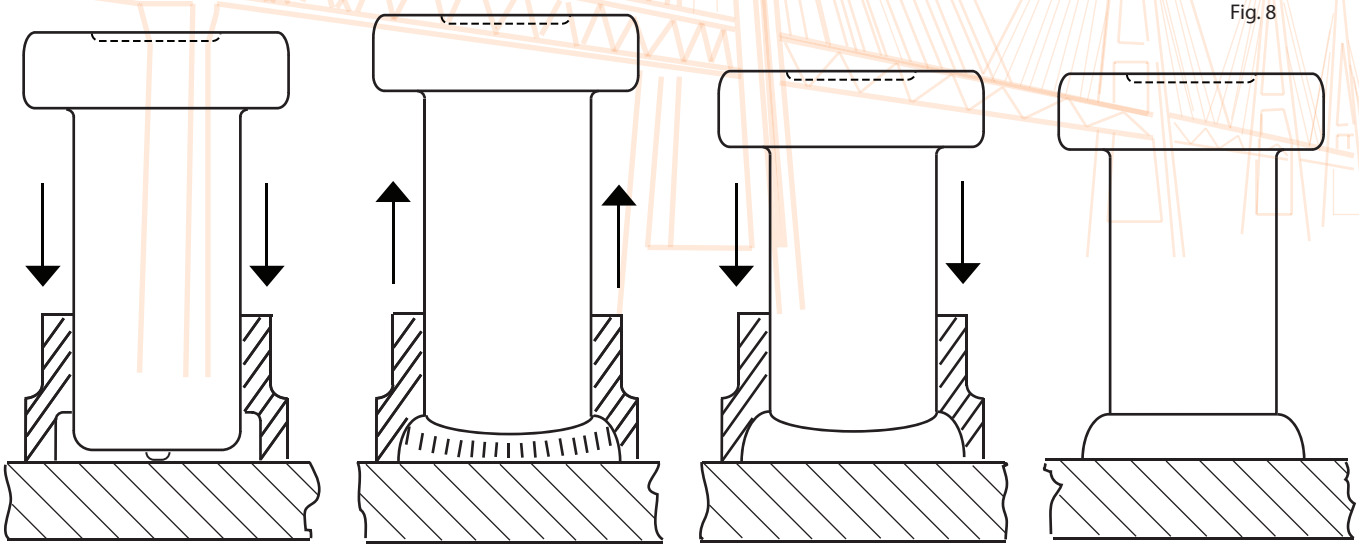
WELDING PROCESS

Connector welding consists in joining metal pieces , normally in the form of rods to metal supports . It is used mainly in bridge building (especially in mixed structures), steel structures , facades and walls.

In the welding arc process connectors are primed briefly between the connector end to be welded and the workpiece : the two parts begin to melt and join together. For proper welding, using the method of arc welding by melting and forging, this can be done mechanically or automatically , using welding guns or heads . The different phases of welding are shown in the drawings below . The connector is inserted into its support and fitted with a ceramic ferrule ,it is applied to the workpiece. At the beginning of the welding process , the connector is raised by the mechanism and , in general , provides an auxiliary arc followed by the main arc between the connector end and the workpiece. This causes the fusion of the plug end and the base material. When welding time has elapsed , the connector is immersed in the molten pool with a specified force (< 100 N) and the current source is disconnected.

SEQUENCE OF THE DIFFERENT PHASES OF ARC WELDING CONNECTOR FOR FUSION AND FORGE

Fig. 8



Connector applying

Elevation and welding arc.

Sinking

Welded connector

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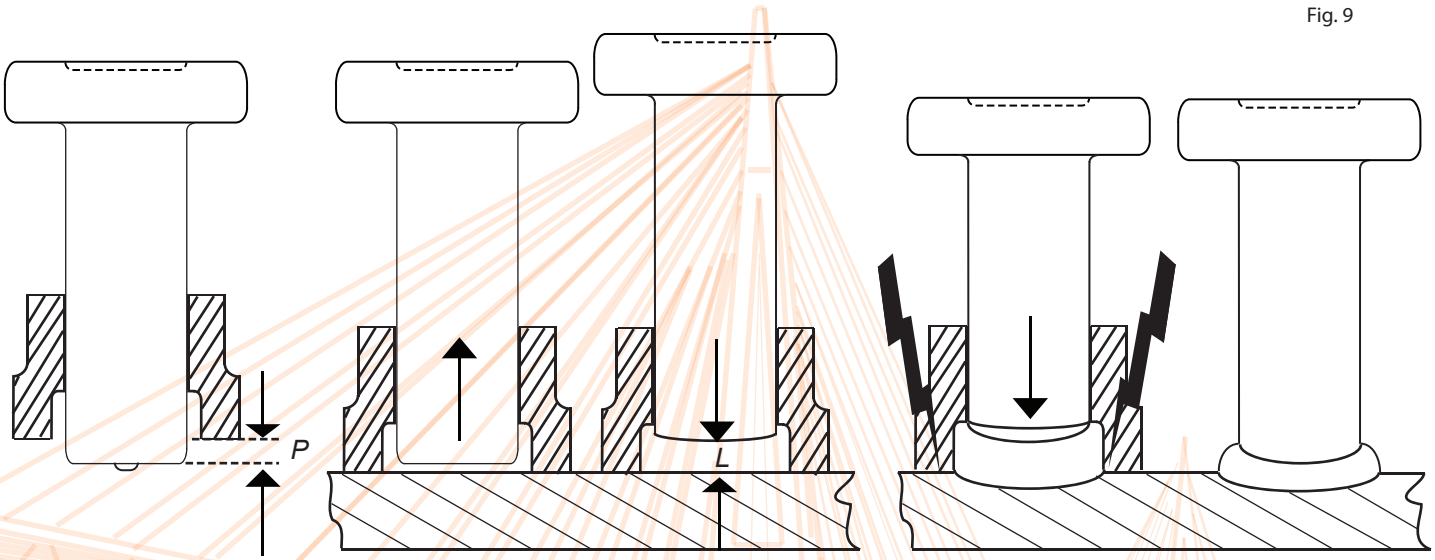
MOVEMENT OF THE PLUG ON THE ARC WELDING CONNECTOR FOR FUSION AND FORGE

Fig. 9



Symbols and Abbreviations
P - Protrusion(1)
L - Elevation
CF - ceramic ferrule
SG - Shielding Gas
DS - Arc Welding of connectors by melting and forging
NP - No protection

(1)
The protrusion is the distance between the connector end and the connector support device in its initial position against the plate support.
This process is generally used in a range of diameters between 3 mm and 25 mm, with a welding time of 100 ms to 3000 ms. It´s generally performed with ceramic ferrules , and only in certain cases, with or without shielding gas or weld pool protection . The minimum thickness of the sheet is 1/4 the diameter of the connector for welding with CF and 1/8 of the diameter in the case of welding with SG , but can not be less than 1 mm.

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VARIATIONS IN THE WELDING PROCESS

Processes	Welding time, t_w ms	Connector diameter, d mm	Current intensity, I A	Flux protection	Minimum steel thickness
Connectors arc welding by melting and forging with cermic ferrule or shielding gas	> 100	3 a 25	300 a 3.000	CF	1/4 d, but at least 1 mm
	< 100	3 a16	300 a 3.000	SG	1/8 d, but at least 1 mm

CERAMIC FERULE

Data chart 1.11

Ceramic ferrule, forming a combustion chamber around the welding, protects welder both from arc as projections. Concentrates the arc in a small area and limiting the heat losses and the cooling rate. The splint protects only slightly ambient air welding. When the connector is plunged into the weld pool, molten metal moves outward from the board to form an annular weld collar around the connector. The welding may thereby be performed at any position. The ceramic ferrule is used for a single welding and removed once the molten metal has solidified .

- The ceramic ferrule must be in contact with the metal base.
- The ceramic ferrule should be arranged concentrically with respect to the connector, and an inclination or an irregular contact between the ferrule and the connector leads to produce an irregular necklace and can prevent the collapse.
- The ceramic ferrules should be stored in a dry place.
- If the risk of hydrogen cracking, ceramic ferrules should be dried at high temperatures (1 h above 900 ° C).

GAS PROTECTION

Welding with shielding gas, the atmosphere around the arc is replaced by a shielding gas, which reduces the formation of blowholes. For steel and most metals, a mixture is used with a 82% argon and 18% carbon dioxide (EN 439-M21).

The shielding gas influences the arc and on the fusion of the connector and the workpiece tension modifying superficial melting bath, also influence on the shape of the weld collar and the shape of the penetration . As a fundamental principle, it should take the welding position PA according to EN ISO 6947. Can also be used to improve a ceramic ferrule collar shape and maintain the arc welding in an area close to the workpiece.

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VARIATIONS IN THE WELDING PROCESS

The gas is supplied by a device that should ensure a uniform gas shield, without turbulence.

Observe the following points:

- The arrival of gas should be annular (side of connector).
- The gas should displace the normal air temperature before starting the welding, it should be noted a preliminary period purge .

UNPROTECTED SHEAR CONNECTOR

Connector welding unprotected is only possible for small diameter (less than 10 mm) and short welding times (less than 100 ms). The disadvantages of this method are the high oxidation of the molten zone, an increase of the blowholes and an irregular seam.
A feature of the welding connectors is the very short duration of the arc time(between 0.5 ms and 3.0 ms) and accordingly the high heating and cooling rate .

METAL BASE

The arc of short duration causes the simultaneous fusion of the connector and the metal base , the two molten parts are mixed to form the modified solder changing the hea tproperties of the affected zone . This phenomenon varies according to diferent connector welding processes. In general, the volume of molten connector exceeds the volume of molten parent metal. Normally, the welding area on the metal base is larger than the cross section of the connector. The strength properties and deformation in the transition zone of the weld and the connector must be examined with special care.

- The surface of the metal base must be clean. Should be removed from the weld zone layers of paint, rust, scale, grease and non-weldable metal coatings. This can be accomplished by a mechanical or chemical process. Coated base metal oxid or scale are ground off perfectly.
- The Surfaces to be welded should be kept dry and free of condensation. When temperatures are below 5 ° C, appropriate preheating may be necessary.
- The quality of the welding of a shear connector depends not only on the strict adherence of the welding process specification, but also the proper operation of the drive mechanism, the state of the bonded, accessories and the supplied energy .

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WELDING IMPERFECTIONS AND CORRECTIVE MEASURES

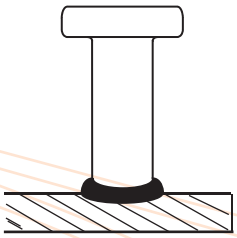
VISUAL ANALYSIS

Symbols and abbreviations

PC - Possible cause
CM - Corrective measures

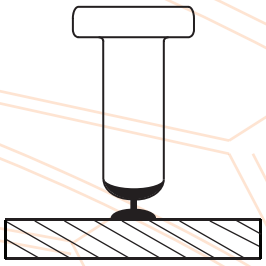
Overall appearance

- Regular collar bright and full. Length after welding, withing the tolerances.



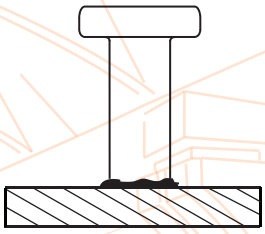
PC - Right parameters.
CM - None.

- Welding of reduce diameter. Excessive length.



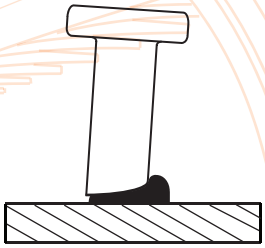
PC - Insufficient sinking or elevation.
- Electirc welding too high.
CM - Increase the sinking check the centering of the ferrule check the elevation.
- Reduce the current and/or welding time.

- Collar small, irregular and gray. Excessive length.



PC - Electric welding too low.
- Moist ceramic ferrule.
CM - Increase the sinking, check the centering of the ferrule check the elevation.
- Increase the current and / or time welding.

- Collar off center. Bites



PC - Blow magnetic arc.
- Incorrectly centered ceramic ferrule.
CM - Attach the ground clamps symmetrically.
- Check the centering.

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WELDING IMPERFECTIONS AND CORRECTIVE MEASURES

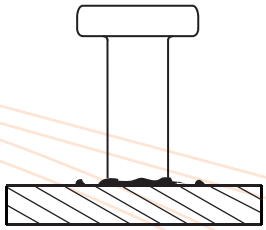
VISUAL ANALYSIS

Symbols and abbreviations

PC - Possible cause
CM - Corrective measures

Overall appearance

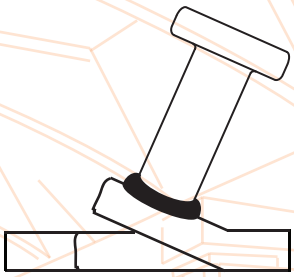
- Height of collar small, bright with significant projections side.
Post weld length too short.



PC - Electric welding too high.
- Speed of sinking too high.
CM - Reduce the current and/or welding time.
- Adjust the collapse and/or the shock of the gun

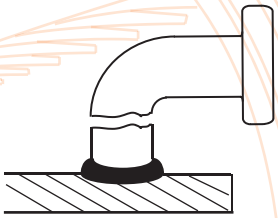
BREAKING REVIEW

- Tear of the base metal.



PC - Right parameters.
CM - None.

- Fracture obove welding collar after a sufficient deformation.



PC - Right parameters.
CM - None.

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WELDING IMPERFECTIONS AND CORRECTIVE MEASURES

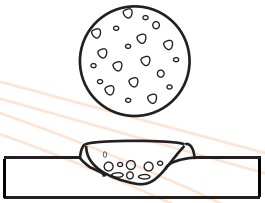
Symbols and abbreviations

PC - Possible cause
CM - Corrective measures

BREAKING REVIEW

Overall appearance

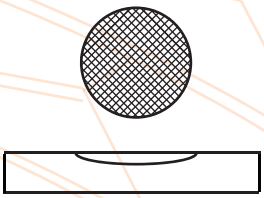
- Tear within the solder, high porosity.



PC
- Electric welding too low.
- Metal inappropriate for welding connector.

CM
- Increase the current and/or welding time.
- Check the chemical composition.

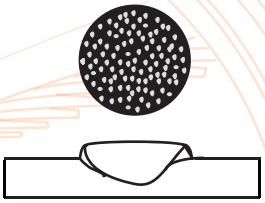
- Fracture in HAZ.
- Fracture in the area, without distortion gray enough.



PC
- Carbon content in the base metal is too high.
- Base metal inappropiate.

CM
- Check the metal base.
- Increasing the welding time.
- May be necessary to preheat.

- Fracture of weld.
- Appearance bright.



PC
- Content of flux too high.
- Welding time too short.

CM
- Check the amount of flux.
- Increasing the welding time.

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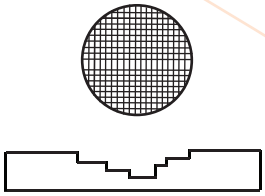
WELDING IMPERFECTIONS AND CORRECTIVE MEASURES

BREAKING REVIEW

Symbols and abbreviations

PC - Possible cause
CM - Corrective measures

Overall appearance

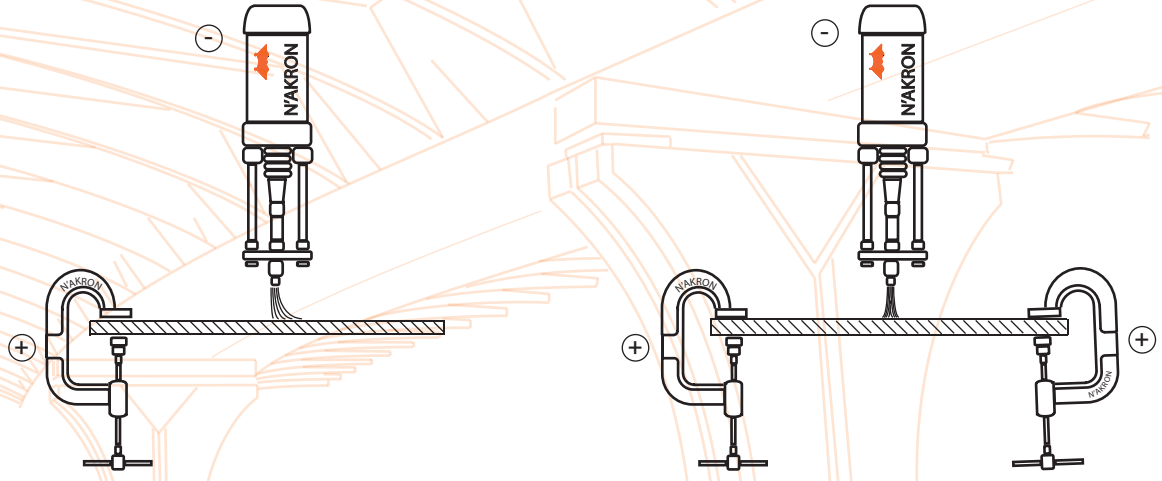


- Tear in the metal base sheet.

PC - Non-metallic inclusions in the metal
- Inappropriate metal base.

EFFECTS OF MAGNETIC ARC BLOW AND POSIBBLE REMEDIES

The magnetic arc blow is proportional to the intensity of the current, and can be remedied by setting the mass clamps and clamping symmetrically with masses compensative or - in the case of hand gun with external welding cable - by pivoting the gun around the vertical axis. The breath magnetic fusion drives on one side and can accentuate the blowholes in the welded materials.



Cause

Remedy

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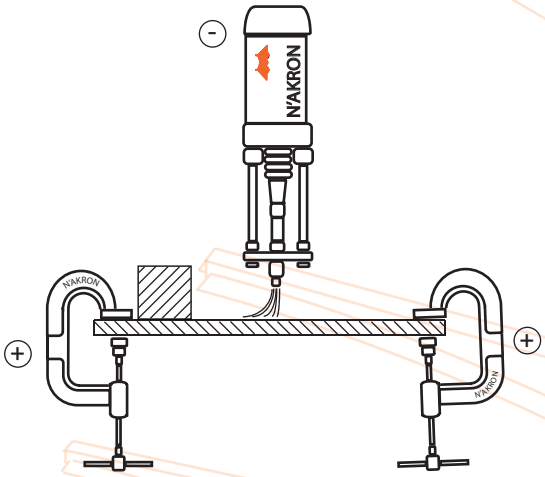
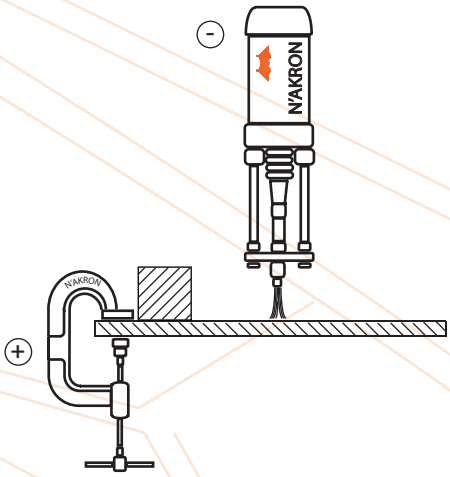
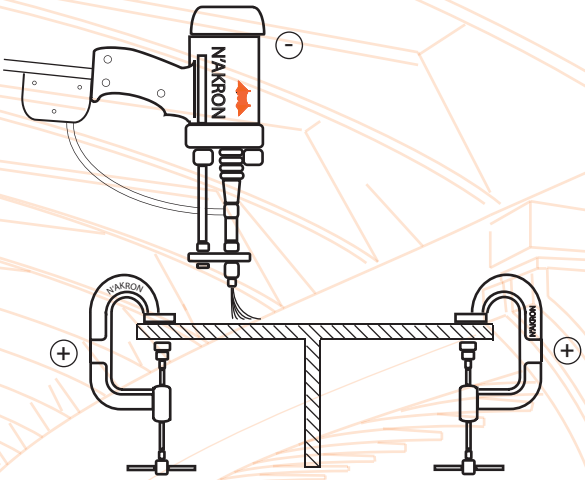
EFFECTS OF MAGNETIC ARC BLOW AND POSIBBLE REMEDIES



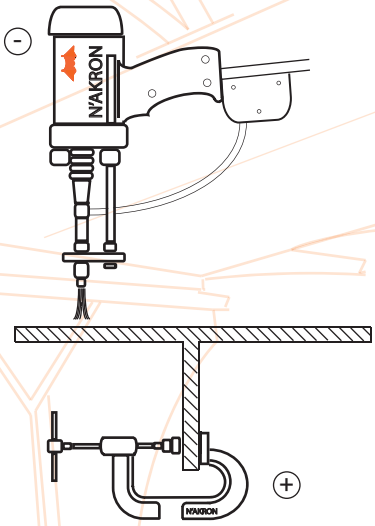
Cause



Remedy



Cause



Remedy

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DEFINITIONS - SYMBOLS AND ABBREVIATIONS

- **Current:** Average value of welding current.
- **Welding Time :** Time difference between priming and the extinction signal of the main arch.
- **Elevation :** Distance between the end of the connector and the surface of the workpiece.
- **Sinking :** Axial movement to work surface.
- **Protusion :** Distance between the connector end face of the device and connector support in its initial position.
- **Blow magnetic arc:** Magnetic arc deviation regarding connectors axial straightness.
- **Flux:** Ball or aluminum coating placed on the connector end to be welded.

SYMBOLS

- C (milifaradios) Capacity .
- D (in mm) Diameter of the connector.
- I (in amperes) current intensity .
- Tw (in milliseconds) welding time .
- U (in volts) Voltage Electrical n load .
- W (watt second) power load.

ABBREVIATIONS

- CF ceramic ferrule .
- DS arc welding of connectors
- HAZ Affected zone
- L elevation
- NP No protection
- P Protusion
- PA flat position
- PC horizontal position
- PE elevated position
- SG Gas protection

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WELDING PARAMETERS

-Polarity.
The connector is connected to the negative and the workpiece to the positive pole . A reverse polarity has been shown effective for certain metals , such as for aluminum (and alloys) and brass **.**

Welding current .
Connector according to the measures , the welding current is between 300 A and 3,000 A approximately. For the welding of steel connectors , not alloyed by arc melting and forging, with ceramic ferrule or shielding gas , the correct current intensity can be assessed mainly by the two following formulas:

I (A) = 80 xd (mm) - for connectors with diameter 16 mm approx.
I (A) = 90 xd (mm) - for connectors with diameters greater than 16 mm.

For an alloy steel, usually choose a lower current by 10 % approx.

Arc voltage
Is mainly determined by the height of elevation and the welding current .Generally used values between 20 V and 40 V. With respect to a normal state of the surface , impurities such as oil or grease, the arc voltage increases , and the use of an inert protective gas reduces the arc voltage.

Welding time
Basically can be estimated by the two following formulas:

tw (A) = 0.02 xd (mm) - for connectors with 12 mm diameter up to approx.
tw (A) = 0.04 xd (mm) - for connectors with diameters greater than 12 mm.

The values shown apply to the welding position PA. The welding time should be reduced for positional welding PC

Elevation
The elevation is between 1.5 mm and 7 mm approximately, and is proportional to the diameter of the connector.
Connectors for welding on coated surfaces , the height of elevation must be higher than is chosen to uncoated surfaces . A higher elevation arc length increases , and therefore the arc voltage . Similarly , the risks of magnetic arc blow .

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WELDING PARAMETERS

Protrusion.

Is generally between 1 mm and 8 mm, and is proportional to the diameter of the connector. Depends on the shape of the welding neck, the shape of the connector end , and (for welding with ceramic ferrule) of the internal configuration of the splint.

Sinking speed .

The sinking velocity should be between about 200 mm / s for connectors with diameters up to 13 mm and 100 mm / s for thicker connectors , in order to prevent molten metal projections . The sinking speed is proportional to the protrusion , in the case of mobile devices without shock.

- Welding variables , for welding of connectors by arc ,melting and forging, with ceramic ferrule or shielding gas.
- Polarity
- Arc voltage
- Welding current
-Welding time
- Elevation
- Protrusion
- Collapse speed

- Number and position of taking the mass

connector diameter mm	Welding time (sg)	Welding current (A)	Arc lenght (mm)	Outer pin (mm)
10	0,25	770	2,0	3,0
13	0,40	950	3,0	3,0
16	0,50	1.450	3,5	3,0
19	0,70	1.650	4,0	3,0
22	0,80	2.000	4,5	4,0
25	1,00	2.300	5,0	4,5

* You have to add total distance to outer-pin

Data chart 1.12

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VISUAL AND MECHANICAL TEST

Typically, solder connectors must be free of imperfections.
In the case of transmission of forces using connectors arc welding processes by melting and forging with ceramic ferrule or shielding gas , welds and breaks should be examined for the presence of pores , lack of fusion , cracks, blowholes and inclusions.
The total area of all imperfections , must not exceed 5 % - 10 % as standard (EN 729 -2 or 3) of the connector area . Cracks are not acceptable. Any imperfections on the surface of rupture of the weld should not exceed 20 % of the diameter of the connector.
Similarly, for small imperfections, the number of imperfections should not exceed the number expected for the diameter of the connector. The blow holes with a diameter below 0.5 mm are not taken into consideration.

- Relationship between the diameter of the connector, the allowable flaw size and the total area of allowable imperfections

Connector diameter mm^2	Allowable flaw size of inperfection d/5 (mm)	Total area of permissible imperfections mm^2 $\frac{d^2 * Л}{80}$
10	2,0	Not aply
12	2,4	Not aply
16	3,2	10,0
19	4,0	15,7
22	4,4	19,0
25	5,0	24,5

Data chart 1.13

- Visual examination.
visual examination covers the uniformity of size and shape of the collar of connectors for welding arc by melting and forging with ceramic ferrule or shielding gas.

- Bend Test .
Connectors bent at 60 degrees for welding arc by melting and forging with ceramic ferrule or shielding gas .
This test serves simply as test workshop, to perform an approximately check for the chosen welding parameters . During the test , the weld is subjected to a bending of an undefined shape .

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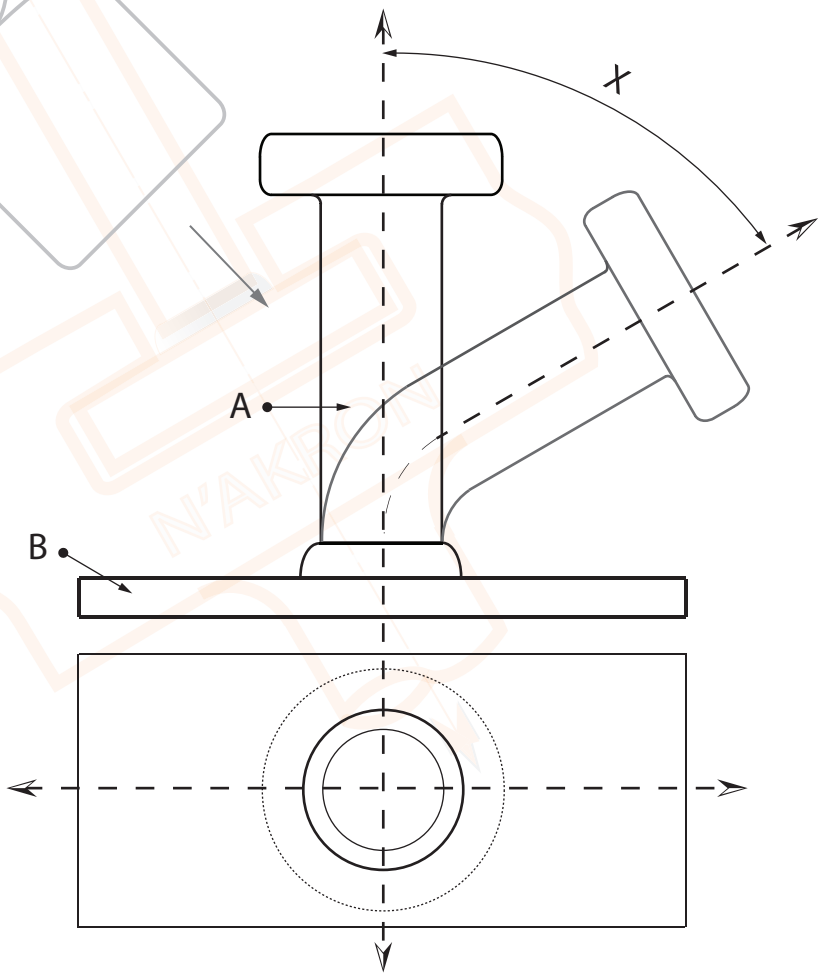
VISUAL AND MECHANICAL TEST

A weld is considered to have met the test requirements if it is not detected any crack in the weld. If appears a fracture with a small deformation in the heat as selected.

Fig. 10



A	Connector
B	Workpiece
X	60^{0}

VISUAL AND MECHANICAL TEST

- Tensile Test.

Used for connector welding processes by melting arc and forging with ceramic ferrule or shielding gas.
Using an appropriate traction device the connectors welded undergo axial tension until fracture. If the base metal is broken or the connector on the outside of the weld after is deformated, the weld is considered satisfactory .
If full quality is required according to EN 729-2, it is not permitted any breakage in the welding zone.
If standard quality is required according to EN 729-3, with respect to the welding connector arc process by melting and forging with ceramic ferrule or shielding gas, fractures located in the welding area are only allowed if it reaches the nominal resistance in tension of the material of the connector. The imperfections on the surfaces of breakage must agree with the limit specified in the general section of examinations and tests.

- Macrographic review.

Required for welding processes connector arc by melting and forging with ceramic ferrule or shielding gas.
In the case of force transmission and full quality requirements according to EN 729-2, imperfections should not exceed the limits given. The microcracks can not be taken into consideration.

- Radiographic Examination.

Only required for connectors by arc welding, melting and forging with ceramic ferrule protective gas with a diameter d> 13 mm, used for the transmission of forces and in which no tensile tests are performed.
To perform the test, the connectors should be cut just below the collar.
When radiographic examination is required in accordance with EN 1435 it must be done with the class B technique .
Imperfections should not exceed the limit specified in paragraph of generalities, of examinations and tests.

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Example of connectors tensile testing

A - Workpiece
B - Welding
C - Bridge
D- connector
E - level adjustment screw
F - Hydraulic cylinder

Fig. 13

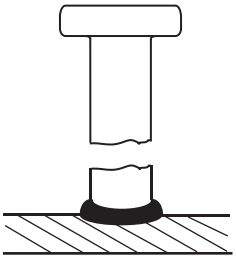


Fig. 12

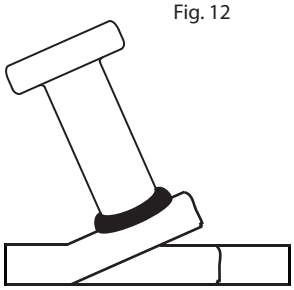
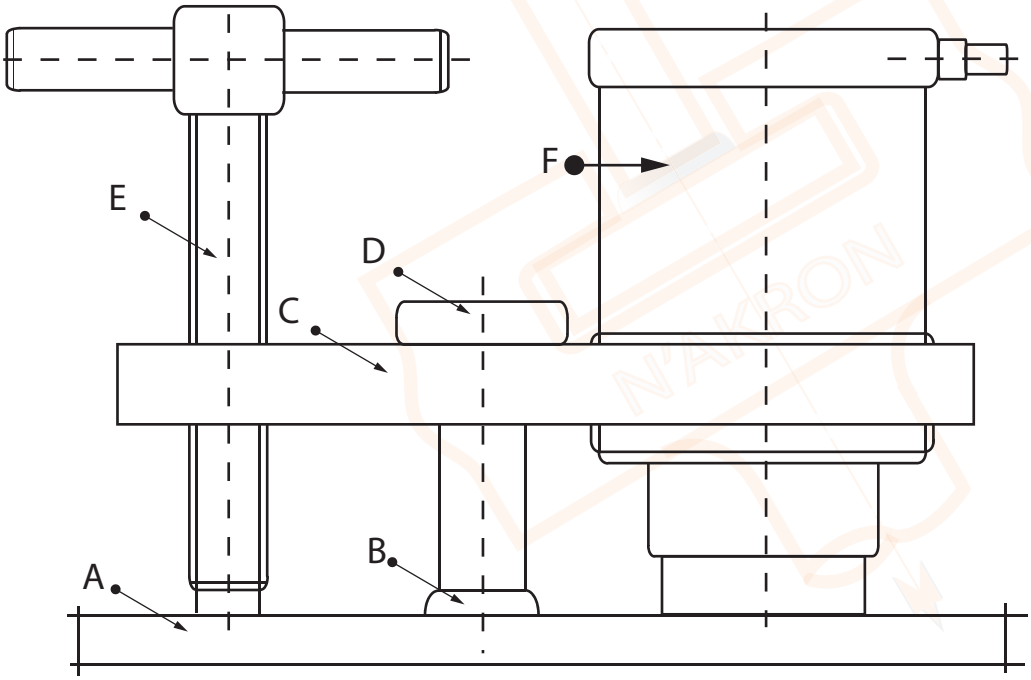


Fig. 11



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d_1	l_2	d_3	h_4	Weight kg/100 ud	Ceramic	Reference
10	50	13	2,5	5,0	UF 10	00005010
10	75	13	2,5	6,0	UF 10	00007510
10	100	13	2,5	8,0	UF 10	00010010
10	125	13	2,5	9,0	UF 10	00012510
10	150	13	2,5	11,0	UF 10	00015010
10	175	13	2,5	12,0	UF 10	00017510
13	50	17	3,0	8,0	UF 13	00005013
13	75	17	3,0	10,0	UF 13	00007513
13	100	17	3,0	13,0	UF 13	00010013
13	125	17	3,0	16,0	UF 13	00012513
13	150	17	3,0	180	UF 13	00015013
13	175	17	3,0	21,0	UF 13	00017513
13	200	17	3,0	23,0	UF 13	00020013
16	50	21	4,5	12.0	UF 16	00005016
16	75	21	4,5	16,0	UF 16	00007516
16	100	21	4,5	20,0	UF 16	00010016
16	125	21	4,5	24,0	UF 16	00012516
16	150	21	4,5	28,0	UF 16	00015016
16	175	21	4,5	32,0	UF 16	00017516
16	200	21	4,5	36,0	UF 16	00020016
16	225	21	4,5	40,0	UF 16	00022516
16	250	21	4,5	44,0	UF 16	00025016
19	50	23	6,0	16,0	UF 19	00005019
19	75	23	6,0	21,0	UF 19	00007519
19	100	23	6,0	27,0	UF 19	00010019
19	125	23	6,0	33,0	UF 19	00012519
19	150	23	6,0	38,0	UF 19	00015019
19	175	23	6,0	44,0	UF 19	00017519
19	200	23	6,0	49,0	UF 19	00020019
19	225	23	6,0	55,0	UF 19	00022519
19	250	23	6,0	60,0	UF 19	00025019
19	275	23	6,0	66,0	UF 19	00027519
19	300	23	6,0	72,0	UF 19	00030019
19	325	23	6,0	77,0	UF 19	00032519
19	350	23	6,0	83,0	UF 19	00035019

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d_1	l_2	d_3	h_4	Weight kg/100 ud	Ceramic	Reference
22	50	29	6,0	20,0	UF 22	00005022
22	75	29	6,0	28,0	UF 22	00007522
22	100	29	6,0	35,0	UF 22	00010022
22	125	29	6,0	43,0	UF 22	00012522
22	150	29	6,0	50,0	UF 22	00015022
22	175	29	6,0	58,0	UF 22	00017522
22	200	29	6,0	65,0	UF 22	00020022
22	225	29	6,0	73,0	UF 22	00022522
22	250	29	6,0	80,0	UF 22	00025022
22	275	29	6,0	88,0	UF 22	00027522
22	300	29	6,0	95,0	UF 22	00030022
22	325	29	6,0	102,0	UF 22	00032522
22	350	29	6,0	110,0	UF 22	00035022
25	75	31	7,0	37,0	UF 25	00007525
25	100	31	7,0	47,0	UF 25	00010025
25	125	31	7,0	57,0	UF 25	00012525
25	150	31	7,0	66,0	UF 25	00015025
25	175	31	7,0	76,0	UF 25	00017525
25	200	31	7,0	85,0	UF 25	00020025
25	225	31	7,0	95,0	UF 25	00022525
25	250	31	7,0	105,0	UF 25	00025025
25	275	31	7,0	114,0	UF 25	00027525
25	300	31	7,0	124,0	UF 25	00030025
25	325	31	7,0	134,0	UF 25	00032525
25	350	31	7,0	143,0	UF 25	00035025

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TECHNICAL DATA

N'Akron connector is made of a material suitable to be welded by arc melting. The dimensions and design of the connector are in accordance with the UNE - EN ISO13918:2008.

N'Akron connector is available in different materials, the properties of each can be documented by a test report 2.2 or by a certificate of inspection 3.1 or 3.2 (EN -10204)

Unalloyed structural steel.

The unalloyed connector to welded by arc melting is made of steel materials belonging to Group 1 in accordance to the standard ISO/TR 15608:2005 requiring very stringent carbon content, the degree of purity, grain size and characteristics of its surface, this makes the material particulary suitable for N'Akron welding connector.

We supply connectors manufactured with steel Group 1, and with the following mechanical properties.

Tensile strength R_m	≥ 450 N/mm^2
Yield strength R_{el}	≥ 350 N/mm^2
Elongation A_5	$\geq$ 15%

These connectors exceed the requeriments of UN - EN ISO 13918:2008

CE Conformity

N'Akron pin connector meets the basic products requirements directive. 89/106/EEC CE

Certificate N0. TC.11/005804 dated 31/05/2011 by UKTC. UK Product Safety Test Center Limited

CONNECTOR DIMENSIONS

The nominal length is the length of the connector after the welding. Connectors provided for welding, are between 1 to 5 mm longer.

N'Akron connectors by arc welding with ceramic ferrule protection, are supplied with a small ball of aluminium at its end as required by the welding process, to facilitate the opening of the arc, stabilize it and deoxidize the surface of metal base.

The correct amount of flux used is a key factor to obtain a perfect result in the weld.

Ceramic ferrule

In the welding of connectors, ceramic ferrule forms a combustion chamber surrounding welding, protecting welder from both arc and welding projection. Concentrates arc in a reduced area and limits the loss of heat and cooling rate. The ceramic ferrule is used for a single weld and removed once the molten metal has solidified.

Welding collar

In the process of the pin welding, collar is formed at the welding joins of the workpiece. Its dimensions depend on welding parameters and the ceramic used.

Marking of packaging

Following information is detailed on the packaging:
cast, units and product as detailed in the following example:
Connector ISO 13918:2008-SD1-19*100-A
Ceramica ferrule UF-19

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