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# CATÁLOGO GSA S.A.
# PERNOS STUD

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Technical Information

✧ Type of studs and symbols for studs and ceramic ferrules

| Type of studs | | | Symbols for studs | Symbols for ceramic ferrules |
|---|---|---|---|---|
| Drawn Arc | Drawn arc stud welding with ceramic ferrules or shielding gas | Threaded stud (pitch) | PD | PF |
| | | Threaded stud with reduced shaft | RD | RF |
| | | Unthreaded stud | UD | UF |
| | | Shear connector | SD | UF |
| | Short-cycle drawn arc stud welding | Threaded stud with flange | FD | - |
| Capacitor Discharge (Tip ignition) | | Threaded stud (pitch) | PT | - |
| | | Unthreaded stud | UT | - |
| | | Stud with internal thread | IT | - |

✧ Material

| Symbol | Material | Mechanical Properties |
|---|---|---|
| PD<br>RD<br>UD | Mild steel<br>4.8 (weldable) | Yield point ($R_{eH}$) min 340N/mm²<br>Tensile strength ($R_m$) min 420N/mm²<br>Elongation (A5) min 14% |
| FD<br>PT<br>UT<br>IT | Stainless steel<br>A2-50 (weldable) | Yield point ($R_{eH}$) min 210N/mm²<br>Tensile strength ($R_m$) min 500N/mm²<br>Elongation (A5) min 25% |
| SD | S235J2G3+C450 | Yield point( $R_{eH}$) min 350N/mm²<br>Tensile strength ($R_m$) min 450N/mm²<br>Elongation (A5) min 15% |

✧ Drawn Arc Welding Positions

| Variant | Drawn arc with ceramic ferrule | Short-cycle drawn arc welding |
|---|---|---|
| Welding positions | Stud diameter | |
|  | ≤25mm | ≤12mm |
|  | ≤16mm | ≤10mm |
|  | ≤20mm | ≤10mm |

✧ All the welding studs' lengths in the catalogue are LBW (Length Before Weld).

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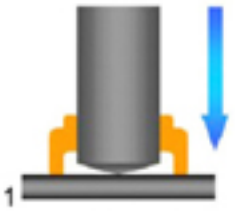
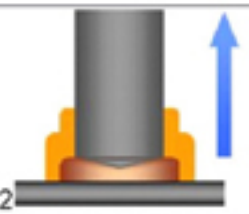
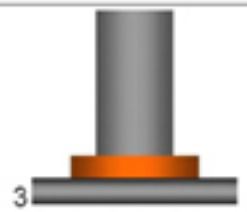
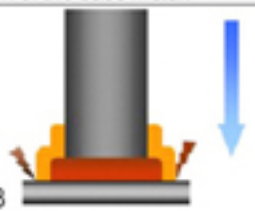
## What's Stud Welding?

Stud Welding is versatile, quickly and one step fastening system, since it invented more than 60 years ago, the stud welding technology have constantly innovated and improved, now, it's widely used in construction, industrial and automotive circle.

With the help of the electric arc as heat source the welding studs are welded on the metal surfaces. There are two different types of stud welding methods for fixing welding studs: The Drawn Arc Welding Process and the Capacitor Discharge Process, see following:

| The differences between Capacitor discharge stud welding and Drawn arc stud welding | |
|---|---|
| Capacitor Discharge | Drawn Arc |
|  The fastener is placed against the workpiece. A spring in the Interior of the welding gun press the stud on the workpiece. |  A fastener and ceramic ferrule are firmly placed against the work surface under spring tension. |
|  The weld gun is activated and stored energy is discharged through the fastener melting the full diameter of its base and a portion of the parent material. |  Upon triggering. The weld gun automatically lifts the fastener from the base metal and initiates a controlled electric arc which melts the end of the fastener and a portion of the base metal. |
|  Spring-loading forces the fastener into the molten metal. |  A ceramic arc shield concentrates the heat and retains the molten material in the weld area from maximum weld strength and reliability. |
|  The fastener is held in the place as the molten metal solidifies and instantly creates a high quality fusion weld. |  At the precise moment the fastener and the parent metal become molten, the fastener is automatically plunged into the work surface. The metal solidifies and a high quality fusion weld is completed. |

| Capacitor Discharge (CD) stud welding provides | Drawn Arc (DA) stud welding provides |
|---|---|
| Welding range up to Ø8 | Welding range up to Ø25 |
| Very appropriate of welding on very thin plates from 0.5mm thickness | Application on sheet metals with a minimum thickness of 2mm |
| Extremely low penetration depth approx. 0.1mm | Penetration depth from approx. 1mm to 3mm |

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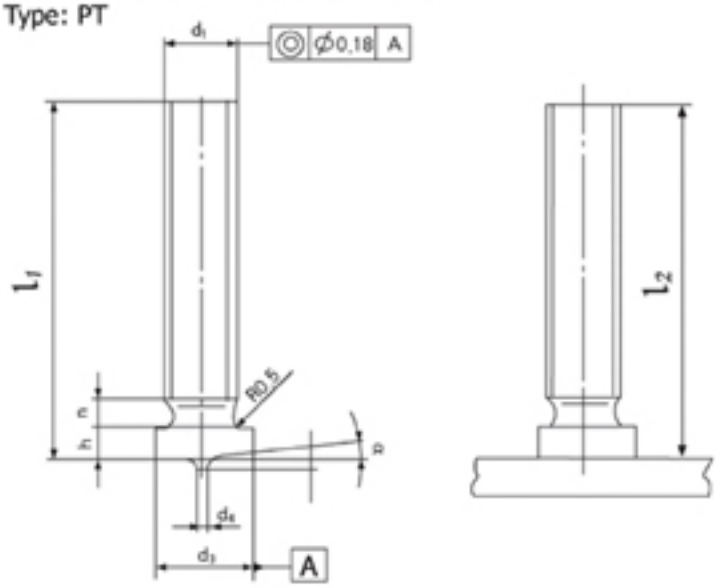
## *Capacitor Discharge Threaded Stud*

According to standard EN ISO 13918

Type: PT




* Dimensions

| $d_1$ | $d_3$±0.2 | $d_4$±0.08 | $l_3$±0.05 | h | $n_{max}$ | α±1° | $l_1$ |
|---|---|---|---|---|---|---|---|
| M3 | 4.50 | 0.60 | 0.55 | 0.7-1.4 | 1.50 | 3° | 6~30 |
| M4 | 5.50 | 0.65 | 0.55 | 0.7-1.4 | 1.50 | 3° | 6~40 |
| M5 | 6.50 | 0.75 | 0.80 | 0.8-1.4 | 2.00 | 3° | 8~40 |
| M6 | 7.50 | 0.75 | 0.80 | 0.8-1.4 | 2.00 | 3° | 8~40 |
| M8 | 9.00 | 0.75 | 0.85 | 0.8-1.4 | 3.00 | 3° | 10~40 |
| M10 | 10.50 | 0.80 | 0.90 | 0.8-1.4 | 3.00 | 3° | 12~40 |

* Material

| | | |
|---|---|---|
| Material | Mild Steel<br>C ≤0.16% Mn ≤0.42%<br>Si ≤0.05% S ≤0.05%<br>P ≤0.011% | Stainless Steel<br>SS304 / SS316 |
| Mechanical Properties | Yield point ($R_{eH}$) ≥340N/mm²<br>Tensile strength ($R_m$) ≥420N/mm²<br>Elongation (A5) ≥14% | Yield point ($R_{eH}$) ≥210N/mm²<br>Tensile strength ($R_m$) ≥500N/mm²<br>Elongation (A5) ≥25% |
| Surface Treatment | Coppered plating is standard | Non |

When inquiring or ordering, specify

1. Type.....PT
2. Diameter.....
3. Length (LBW).....
4. Material.....

Example.

welding stud type PT, M6x50, SS304

* Other dimensions and special parts are available on request.

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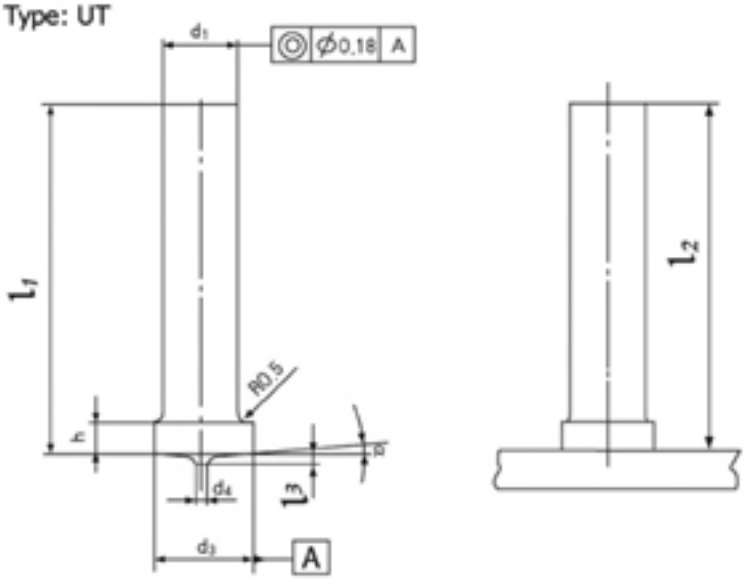
## *Capacitor Discharge Unthreaded Stud*

According to standard EN ISO 13918

Type: UT




* Dimensions

| $d_1$±0.1 | $d_3$±0.2 | $d_4$±0.08 | $L_3$±0.05 | h | α±1° | $l_1$ |
|---|---|---|---|---|---|---|
| 3 | 4.50 | 0.60 | 0.55 | 0.7-1.4 | 3° | 6~20 |
| 4 | 5.50 | 0.65 | 0.55 | 0.7-1.4 | 3° | 6~30 |
| 5 | 6.50 | 0.75 | 0.80 | 0.8-1.4 | 3° | 10~30 |
| 6 | 7.50 | 0.75 | 0.80 | 0.8-1.4 | 3° | 10~30 |

* Material

| | | |
|---|---|---|
| Material | Mild Steel<br>C ≤0.16%  Mn ≤0.42%<br>Si ≤0.05%  S ≤0.05%<br>P ≤0.011% | Stainless Steel<br>SS304/SS316 |
| Mechanical Properties | Yield point ($R_{eH}$) ≥340N/mm²<br>Tensile strength ($R_m$) ≥420N/mm²<br>Elongation (A5) ≥14% | Yield point($R_{eH}$) ≥210N/mm²<br>Tensile strength ($R_m$) ≥500N/mm²<br>Elongation (A5) ≥25% |
| Surface Treatment | Coppered plating is standard | Non |

When inquiring or ordering, specify

1. Type.....UT
2. Diameter.....
3. Length (LBW).....
4. Material.....

Example.

welding stud type UT, 6x20, mild steel

* Other dimensions and special parts are available on request.

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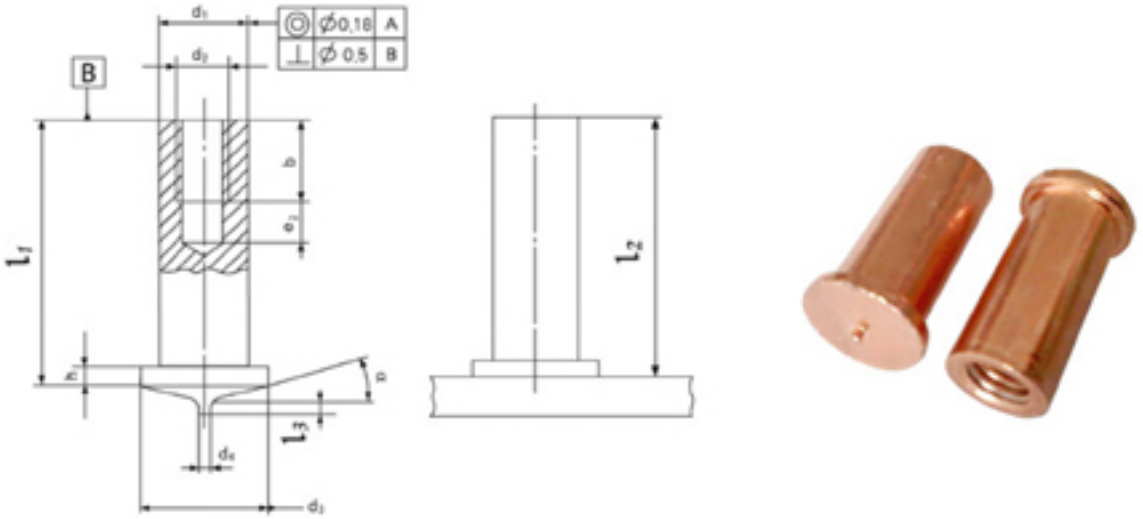
## *Capacitor Discharge Stud With Internal Thread*

According to standard EN ISO 13918

Type: IT




* Dimensions

| $d_1$±0.1 | $d_2$ | b+0.5 | $e_{2min}$ | $d_3$±0.2 | $d_4$±0.08 | $l_3$±0.05 | h | α±1° | $l_1$ |
|---|---|---|---|---|---|---|---|---|---|
| 5 | M3 | 5 | 2.50 | 6.50 | 0.75 | 0.80 | 0.7-1.4 | 3° | 8~30 |
| 6 | M4 | 6 | 3.00 | 7.50 | 0.75 | 0.80 | 0.7-1.4 | 3° | 8~30 |
| 7.1 | M5 | 7 | 3.00 | 9.00 | 0.75 | 0.80 | 0.8-1.4 | 3° | 10~40 |

* Material

| | | |
|---|---|---|
| Material | Mild Steel<br>C ≤0.16% Mn ≤0.42%<br>Si ≤0.05% S ≤0.05%<br>P ≤0.011% | Stainless Steel<br>SS304/SS316 |
| Mechanical Properties | Yield point ($R_{eH}$) ≥340N/mm²<br>Tensile strength ($R_m$) ≥420N/mm²<br>Elongation (A5) ≥14% | Yield point($R_{eH}$) ≥210N/mm²<br>Tensile strength ($R_m$) ≥500N/mm²<br>Elongation (A5) ≥25% |
| Surface Treatment | Coppered plating is standard | Non |

When inquiring or ordering, specify

1. Type.....IT
2. Internal diameter.....
3. Outer diameter.....
4. Length(LBW).....
5. Material.....

Example.

welding stud type IT, M4x6x20, Mild steel

* Other dimensions and special parts are available on request.

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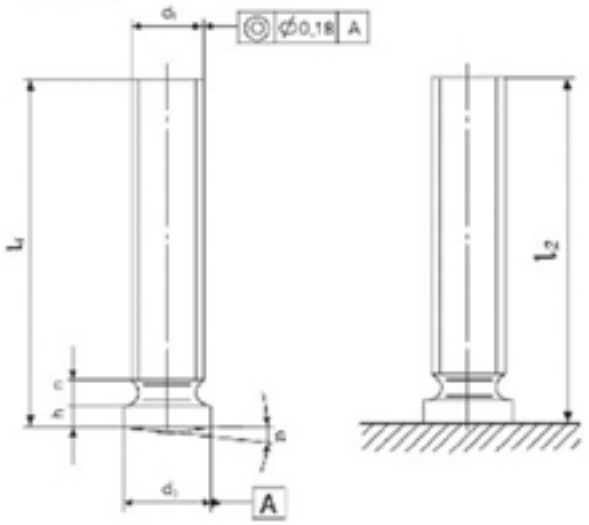
*Short-Cycle Threaded Stud With Flange*

According to standard EN ISO 13918

Type: FD




* Dimensions

| $d_1$ | $d_3$±0.2 | h | $n_{max}$ | α±1° | $l_1$ |
|---|---|---|---|---|---|
| M3 | 4.50 | 0.7-1.4 | 1.50 | 7° | 8~25 |
| M4 | 5.50 | 0.7-1.4 | 1.50 | 7° | 10~30 |
| M5 | 6.50 | 0.8-1.4 | 2.00 | 7° | 10~30 |
| M6 | 7.50 | 0.8-1.4 | 2.00 | 7° | 12~30 |
| M8 | 9.00 | 0.8-1.4 | 2.00 | 7° | 12~35 |
| M10 | 10.50 | 0.8-1.4 | 2.00 | 7° | 12~40 |
| M12 | 13.00 | 0.8-1.4 | 2.00 | 7° | 12~45 |

* Material

| | | |
|---|---|---|
| Material | Mild Steel<br>C ≤0.16% Mn ≤0.42%<br>Si ≤0.05% S ≤0.05%<br>P ≤0.011% | Stainless Steel<br>SS304/SS316 |
| Mechanical Properties | Yield point ($R_{eH}$) ≥340N/mm²<br>Tensile strength ($R_m$) ≥420N/mm²<br>Elongation (A5) ≥14% | Yield point ($R_{eH}$) ≥210N/mm²<br>Tensile strength ($R_m$) ≥500N/mm²<br>Elongation (A5) ≥25% |
| Surface Treatment | Coppered plating is standard | Non |

When inquiring or ordering, specify

1. Type.....FD
2. Diameter.....
3. Length (LBW).....
4. Material.....

Example.

* Other dimensions and special parts are available on request.

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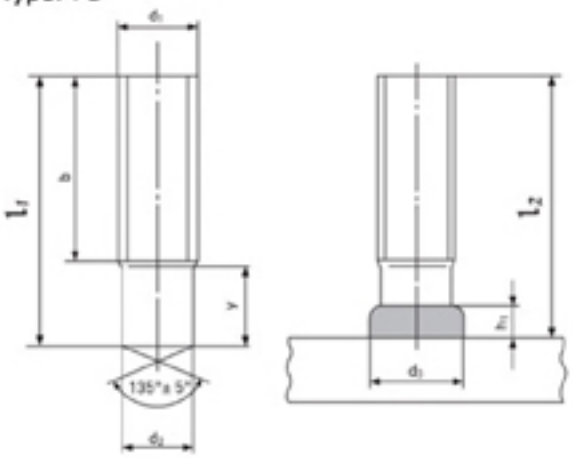
## *Drawn Arc Threaded Stud*

According to standard EN ISO 13918

Type: PD




* Dimensions

| $d_1$ | M6 | M8 | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|---|
| $d_2$ | 5.35 | 7.19 | 9.03 | 10.86 | 14.70 | 18.38 |
| $d_3$ | 8.50 | 10.00 | 12.50 | 15.50 | 19.50 | 24.50 |
| $h_1$ | 3.50 | 3.50 | 4.00 | 4.50 | 6.00 | 7.00 |
| $y_{min}$ | 9.00 | 9.00 | 9.50 | 10.00 | 13.50 | 15.50 |
| $l_1$ | 15~30 | 20~50 | 20~50 | 25~60 | 30~160 | 35~70 |
| Ferrule | PF6 | PF8 | PF10 | PF12 | PF16 | PF20 |

* Material

| | | |
|---|---|---|
| Material | Mild Steel<br>C ≤0.16% Mn ≤0.42%<br>Si ≤0.05% S ≤0.05%<br>P ≤0.011% | Stainless Steel<br>SS304 /SS316 |
| Mechanical Properties | Yield point ($R_{eH}$) ≥340N/mm²<br>Tensile strength ($R_m$) ≥420N/mm²<br>Elongation (A5) ≥14% | Yield point ($R_{eH}$) ≥210N/mm²<br>Tensile strength ($R_m$) ≥500N/mm²<br>Elongation (A5) ≥25% |
| Surface Treatment | Non | Non |
| Aluminium Arc Tip | Standard | Available upon request |

When inquiring or ordering, specify

1. Type.....PD
2. Diameter.....
3. Length (LBW).....
4. Material.....

* Other dimensions and special parts are available on request.

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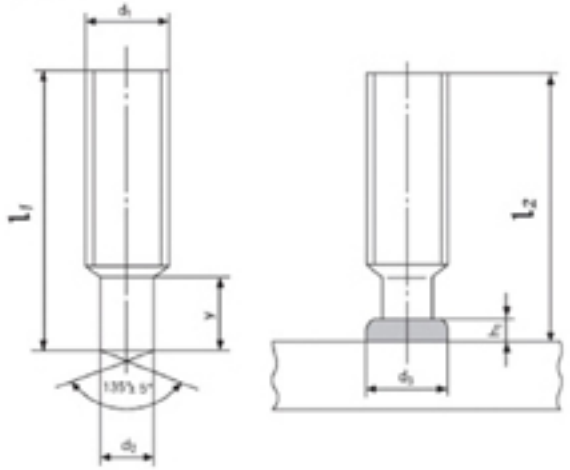
*Drawn Arc Threaded Stud With Reduced Shaft*

According to standard EN ISO 13918

Type: RD



* Dimensions

| $d_1$ | M6 | M8 | M10 | M12 | M16 | M20 |
|---|---|---|---|---|---|---|
| $d_2$ | 4.70 | 6.20 | 7.90 | 9.50 | 13.20 | 16.50 |
| $d_3$ | 7.00 | 9.00 | 11.50 | 13.50 | 18.00 | 23.00 |
| $h_1$ | 2.50 | 2.50 | 3.00 | 4.00 | 5.00 | 6.00 |
| $y_{min}$ | 4.00 | 4.00 | 5.00 | 6.00 | 7.00 | 9.00 |
| $l_1$ | 15~30 | 20~50 | 20~50 | 25~60 | 30~60 | 35~70 |
| Ferrule | RF6 | RF8 | RF10 | RF12 | RF16 | RF20 |

* Material

| | | |
|---|---|---|
| Material | Mild Steel<br>C ≤0.16% Mn ≤0.42%<br>Si ≤0.05% S ≤0.05%<br>P ≤0.011% | Stainless Steel<br>SS304 /SS316 |
| Mechanical Properties | Yield point ($R_{eH}$) ≥340N/mm²<br>Tensile strength ($R_m$) ≥420N/mm²<br>Elongation (A5) ≥14% | Yield point ($R_{eH}$) ≥210N/mm²<br>Tensile strength ($R_m$) ≥500N/mm²<br>Elongation (A5) ≥25% |
| Surface Treatment | Non | Non |
| Aluminium Arc Tip | Standard | Available upon request |

When inquiring or ordering, specify

1. Type.....RD
2. Diameter.....
3. Length (LBW).....
4. Material.....

Example.

welding stud type RD, M10x40, mild steel

* Other dimensions and special parts are available on request.

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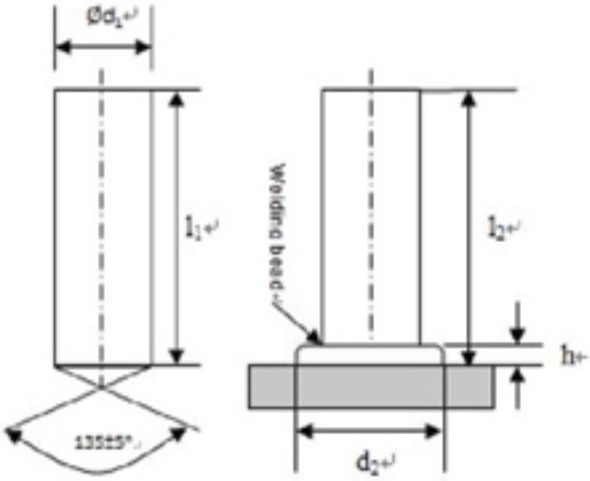
## *Drawn Arc Unthreaded Stud*

According to standard EN ISO 13918

Type: UD




* Dimensions

| | | | | | | |
|---|---|---|---|---|---|---|
| $d_1$ | 6 | 8 | 10 | 12 | 16 | 18.2 |
| $d_2$ | | 11 | 13 | 16 | 21 | |
| h | | 4 | 4 | 5 | 7 | |
| $l_1$ | | 30~80 | 40~80 | 40~100 | 50~100 | |
| Ferrule | UF6 | UF8 | UF10 | UF12 | UF16 | UF19 |

* Material

| | | |
|---|---|---|
| Material | Mild Steel<br>C ≤0.16% Mn ≤0.42%<br>Si ≤0.05% S ≤0.05%<br>P ≤0.011% | Stainless Steel<br>SS304 /SS316 |
| Mechanical Properties | Yield point ($R_{eH}$) ≥340N/mm²<br>Tensile strength ($R_m$) ≥420N/mm²<br>Elongation (A5) ≥14% | Yield point ($R_{eH}$) ≥210N/mm²<br>Tensile strength ($R_m$) ≥500N/mm²<br>Elongation (A5) ≥25% |
| Surface Treatment | Non | Non |
| Aluminium Arc Tip | Standard | Available upon request |

When inquiring or ordering, specify

1. Type.....UD
2. Diameter.....
3. Length (LBW).....
4. Material.....

Example.

welding stud type UD,10x50, mild steel

* Other dimensions and special parts are available on request.

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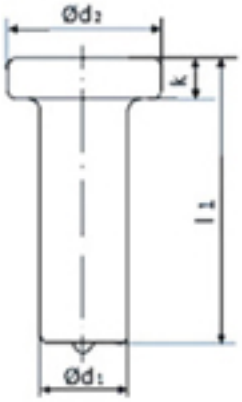
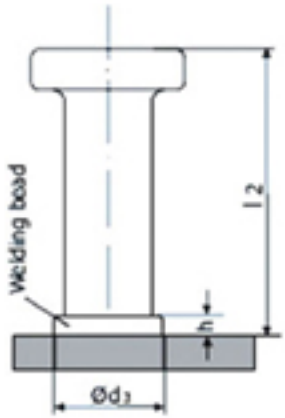
*Drawn Arc Shear Connector*

According to standard EN ISO 13918

Type: SD




* Dimensions

| | | | | | | |
|---|---|---|---|---|---|---|
| $d_{1-0.4}$ | 10 | 13 | 16 | 19 | 22 | 25 |
| $d_{2+0.3}$ | 19 | 25 | 32 | 32 | 35 | 40 |
| $d_3$ | 13 | 17 | 21 | 23 | 29 | 31 |
| $k_{\pm 0.5}$ | 7 | 8 | 8 | 10 | 10 | 12 |
| h | 2.5 | 3 | 4.5 | 6 | 6 | 7 |
| $l_1{}^{+1}{}_{-2}$ | 40~105 | 40~160 | 40~200 | 40~200 | 80~200 | 80~200 |
| Ferrule | UF10 | UF13 | UF16 | UF19 | UF22 | UF25 |

* Material

| | | |
|---|---|---|
| Material | Mild Steel<br>S235J2G3+C450 | Stainless Steel<br>SS304/SS316 |
| Mechanical Properties | Yield point ($R_{eH}$) ≥350N/mm²<br>Tensile strength ($R_m$) ≥450N/mm²<br>Elongation (A5) ≥15% | Yield point($R_{eH}$) ≥210N/mm²<br>Tensile strength ($R_m$) ≥500N/mm²<br>Elongation (A5) ≥25% |
| Surface Treatment | Non | Non |
| Aluminium Arc Tip | Standard | Available upon request |

When inquiring or ordering, specify

1. Type.....SD
2. Diameter.....
3. Length (LBW).....
4. Material.....

Example.

welding stud type SD, 13x100, mild steel

* Other dimensions and special parts are available on request.

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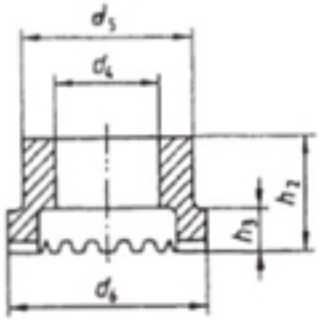
*Ceramic Ferrule*

According to standard EN ISO 13918

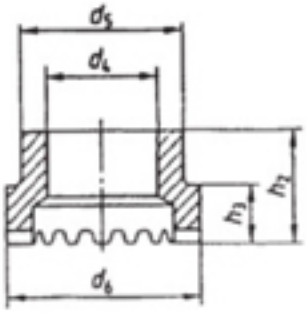
## 1. Type PF for threaded stud

| Type | $d_4$ | $d_5$ ±1 | $d_6$ ±1 | $h_2$ ≈ | $h_3$ ≈ |
|---|---|---|---|---|---|
| PF6 | $5.6^{+0.5}$ | 9.5 | 11.5 | 6.5 | 3.3 |
| PF8 | $7.4^{+0.5}$ | 11.5 | 15 | 6.5 | 4.5 |
| PF10 | $9.2^{+0.5}$ | 15 | 17.8 | 6.5 | 4.5 |
| PF12 | $11.1^{+0.5}$ | 16.5 | 20 | 9 | 5.5 |
| PF16 | $15.0^{+0.5}$ | 20 | 26 | 10 | 7 |
| PF20 | $18.6^{+0.5}$ | 30.7 | 33.8 | 11 | 6 |
| PF24 | $22.4^{+1}$ | 30.7 | 38.5 | 18.5 | 14 |



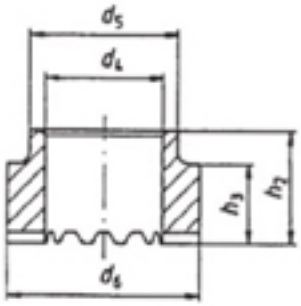

## 2. Type UF for unthreaded stud and shear connector

| Type | $d_4^{+05}$ | $d_5^{\pm1}$ | $d_6^{\pm1}$ | $h_2$≈ | $h_3$≈ |
|---|---|---|---|---|---|
| UF6 | 6.2 | 9.5 | 11.5 | 8.7 | 4.7 |
| UF8 | 8.2 | 11 | 15 | 8.7 | 4.7 |
| UF10 | 10.2 | 15 | 17.8 | 10 | 5.2 |
| UF12 | 12.2 | 16.5 | 20 | 10.7 | 6 |
| UF13 | 13.1 | 20 | 22.2 | 11 | 6.5 |
| UF16 | 16.3 | 26 | 30 | 13 | 8.5 |
| UF19 | 19.4 | 26 | 30.8 | 16.7 | 12 |
| UF22 | 22.8 | 30.7 | 39 | 18.6 | 14 |
| UF25 | 26 | 35.5 | 41 | 21 | 16.5 |




## 3. Type RF for thread stud with reduced shaft

| Type | $d_4^{+04}$ | $d_5^{\pm1}$ | $d_6^{\pm1}$ | $h_2$≈ | $h_3$≈ |
|---|---|---|---|---|---|
| RF6 | 6.2 | 9.5 | 16.2 | 10 | 6 |
| RF8 | 8.2 | 12 | 15.3 | 9 | 5.5 |
| RF10 | 10.2 | 15 | 18.5 | 11.5 | 7.5 |
| RF12 | 12.2 | 17 | 20 | 13 | 8 |
| RF16 | 16.3 | 20.5 | 26.5 | 15.3 | 10.8 |
| RF20 | 17.5 | 26.2 | 32 | 22 | 11.5 |

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