MCT Brattberg welding guidelines

"Welding is more than joining metals; it's the craft of building connections, sparking innovation, and forging the future one weld at a time."

REV20250609OJ

Abstract

This guideline serves as an aid for the welding responsible to develop a Welding Procedure Specification (WPS). This may vary for each site due to local requirements and regulations.

Personnel competence recommendations

For reliable and high-quality results, all welding must be performed by certified professional welders and in accordance with the applicable local regulations.

Welding methods described in the guideline

- Shielded metal arc welding (SMAW)
- Flux core arc welding (FCAW)
- Gas tungsten arc welding (GTAW)

Welding consumables

Welding consumables should be selected based on the materials to be welded. They must be handled and treated according to the manufacturer's instructions.

Welding quality levels for imperfections of the frame

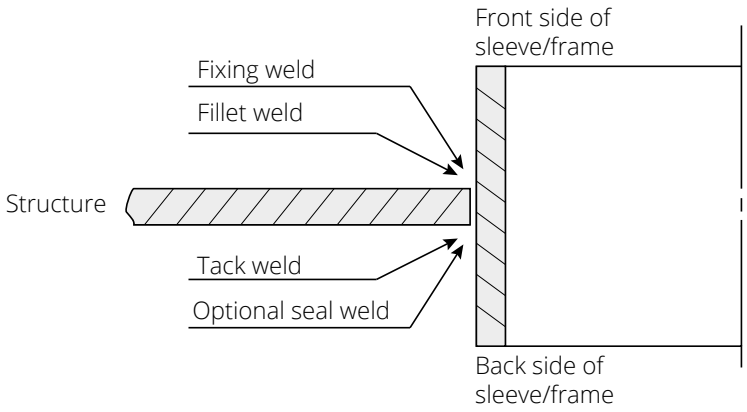
MCT Brattberg frames manufactured in mild steel and stainless steel are welded according to EN-ISO 5817 Min Class C. Aluminum frames are welded according to EN-ISO 10042 Min Class C.

Requirements after welding

The MCT Brattberg system is certified for pressure up to 6 bar. Therefore, we recommend non-destructive testing of the welds, such as liquid penetrant testing, ultrasonic testing, and magnetic particle testing. The dimensions should follow the table on page 9 to ensure optimal performance of the transit.

Legend

Location of various welds between structure and sleeve/frame.



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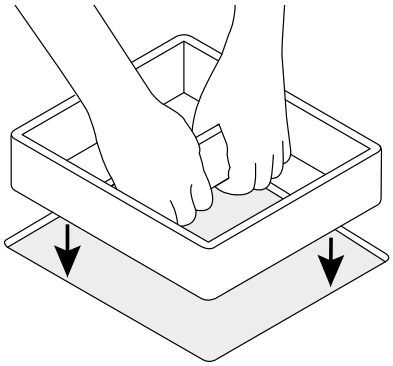
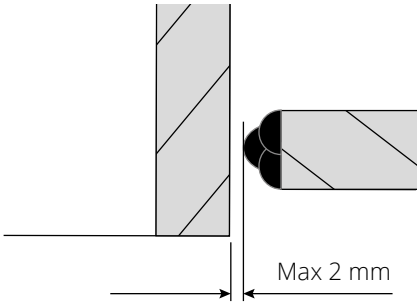
1 Aperture and weld buildup

1.1 For frames without flange

The aperture should be made as close to the outer dimensions of the frame as possible to minimize large root gaps. The maximum allowed total root gap before welding is 2 mm. Larger gaps must be minimized using weld buildup to prevent deformation of the frame. The weld buildup shall not be performed on the frame.



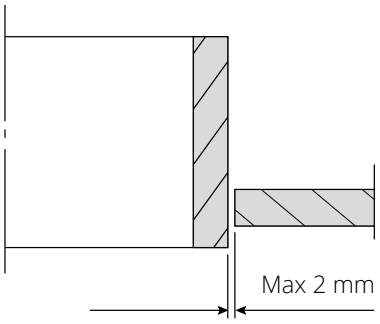
Measure the aperture using the frame to ensure accurate alignment and fit before welding.



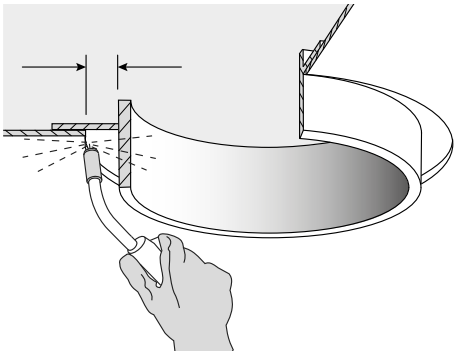
Weld buildup of the aperture shall be performed on the structure, not on the frame.

1.2 For frames with flange

The aperture should be made with a minimum clearance of 15 mm. The edge of the aperture should be positioned at the center of the frame's flange to allow space for welding on the inside.



The maximum total root gap for a fillet weld should not exceed 2 mm. If the gap is larger, it must be minimized using weld buildup to ensure proper welding quality and to prevent deformation.



The frame with a flange should be positioned in the aperture so that the edge of the aperture is centered on the flange. This ensures sufficient space for welding on the inside.

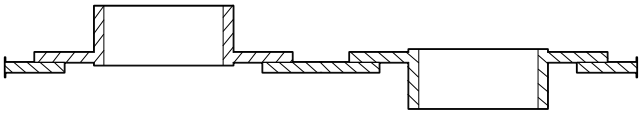
2 Positioning and fixing

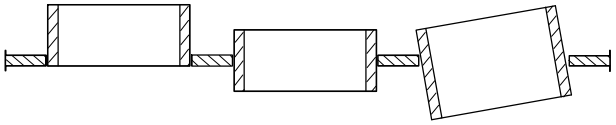
The frame or sleeve can be centered or fixed in a corner of the aperture at any depth or angle. It is crucial not to exceed the maximum allowed root gap, even when welding the frame at an angle. Frames and sleeves with a flange must fully cover the aperture.

Check fire certification to ensure compliance with the allowed positioning.

2.1 Positioning

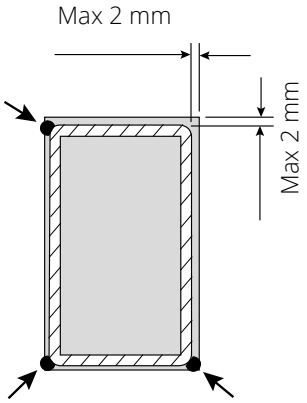
When positioning the frame in weather-exposed areas, it is recommended to have the frame or sleeve protruding and/or tilted from the structure to prevent standing water and icing on the transit. Frames and sleeves welded to moving structures should, if possible, be tilted away from the direction of travel.



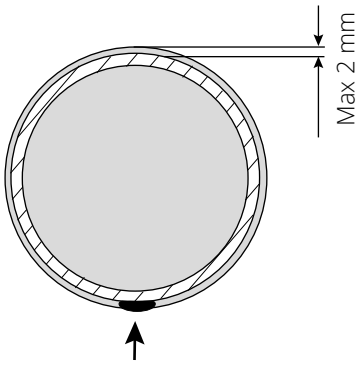


2.2 Fixing

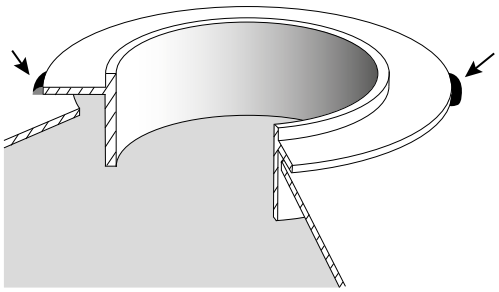
The frame shall be centered in the aperture at any depth. The maximum allowed root gap is 2 mm to prevent heat deflection.



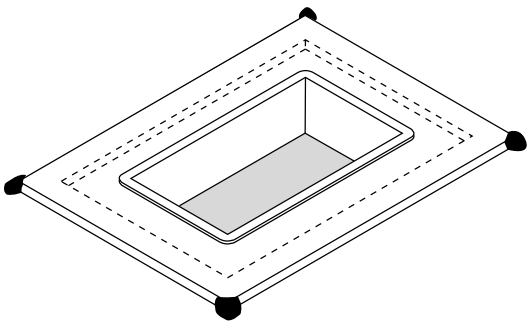
Fixing of rectangular frame without flange.



Fixing of sleeve without flange.



Fixing of sleeve with flange.

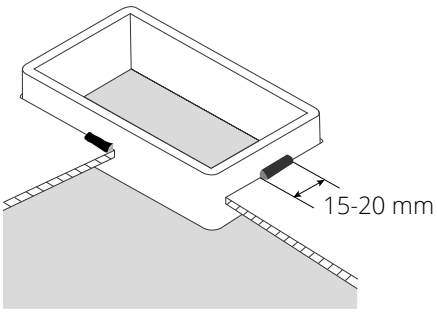


Fixing of rectangular frame with flange.

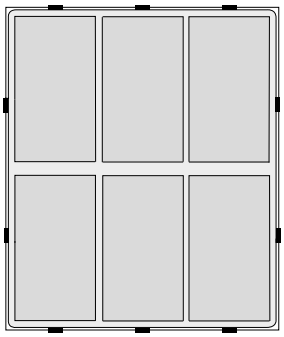
3 Tack weld

Apply tack welds with a length of 15–20 mm on the back side at the corners and in the center of every opening of the flange. If necessary use an appropriate welding clamp to clamp the frame within tolerance throughout the entire welding process to prevent heat deflection. The welding clamp should not be removed until the frame temperature has dropped below 50°C.

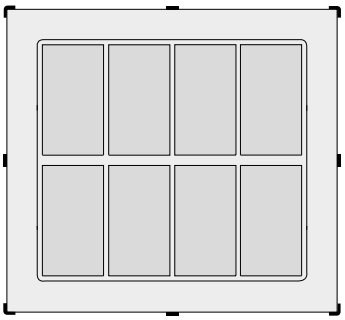
Note: If the fillet weld is applied on only one side, the tacking must be made on the opposite side.



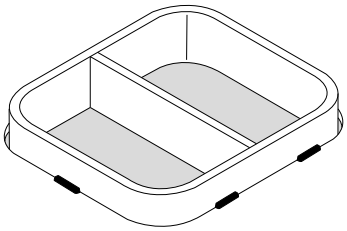
Tack weld applied on a rectangular frame without flange.



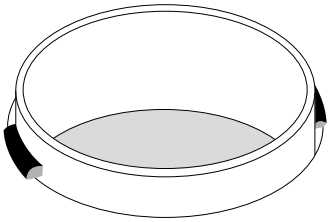
Tack weld of a rectangular combination frame without flange.



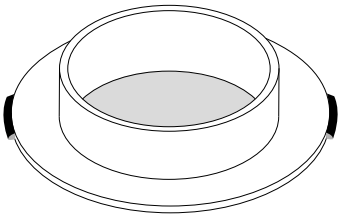
Tack weld of a rectangular combination frame with flange..



Tack welded rectangular frame without flange.

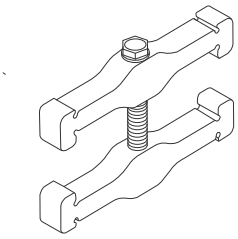


Tack weld of a sleeve without flange.



Tack weld of a sleeve with flange

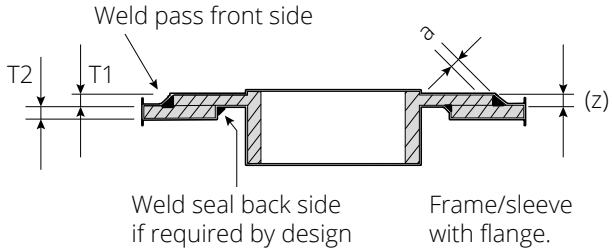
MCT Brattberg welding clamp can be used on frames and are designed to prevent frames from expanding beyond tolerance during welding. By clamping the frame partition walls early in the welding process, the heat input from the weld is effectively controlled.

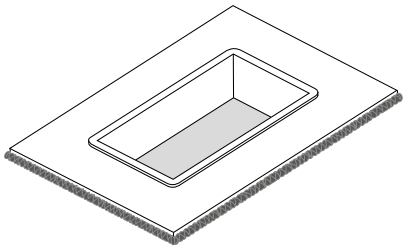


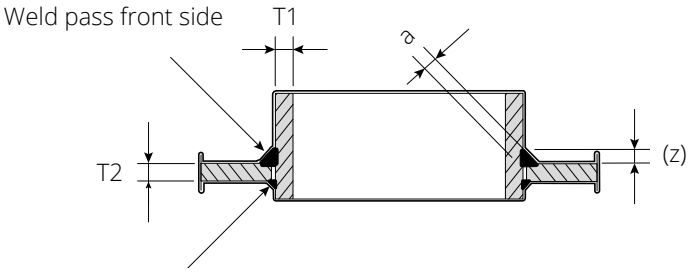
MCT Brattberg Welding clamp

4 Fillet and weld seal

- Apply the fillet weld seal in multiple weld seams on the front side, maintaining an interpass temperature below 150˚C for stainless steel or aluminum and below 250˚C for mild steel. Each weld pass shall not exceed 150 mm in length..
- Grind off the tack welds on the back side before applying the optional seal weld.







Note: The optional weld seal is for corrosion protection only and not mandatory unless specified by the design.

Weld sizes				Max heat input (kJ/mm)		
Frame thickness T1	**Structure thickness T2**	**Fillet weld size (max)**	**Seal weld size (max)**	**Mild steel**	**Stainless steel**	**Aluminum**
5-6	3<T2<12	a3 (z4)	a3 (z4)	1.1	1.0	0.8
10-12	≤6	a4 (z5)	a3 (z4)	1.1	1.0	0.8
10-12	>6	a5 (z7)	a3(z4)	1.1	1.0	0.8

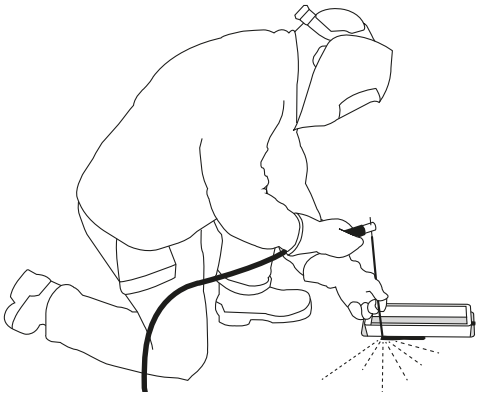
$$Q = \frac{U \times I \times 60}{v \times 1000} \times k$$

Q = Heat input	(KJ/mm)
U = Voltage	(V)
I = Current	(A)
v = Welding speed	(mm/min)
k = Thermal efficiency	(dimensionless)

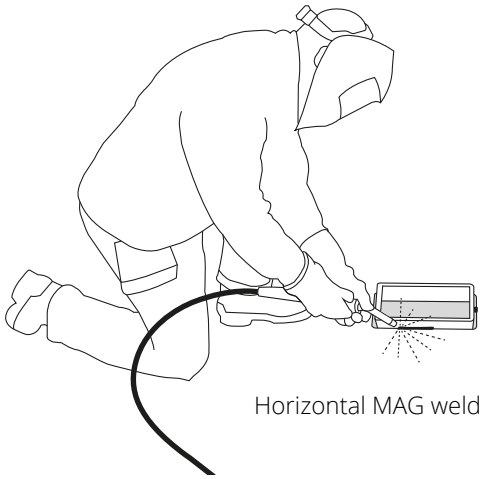
Welding method	Thermal efficiency
MMA (manual metal arc, SMAW)	0.8
MIG/MAG (metal inert gas/metal active gas, GMAW)	0.8
TIG (tungsten inert gas, GTAW)	0.6

4.1 Weld passes – frames/sleeves without flange (horizontal weld)

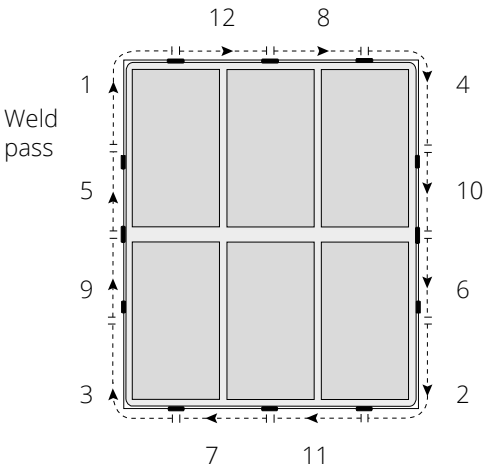
The weld passes should be evenly distributed to minimize heat buildup. When welding large frame sizes, consider the weld length and interpass temperatures to maintain structural integrity and prevent deformation.

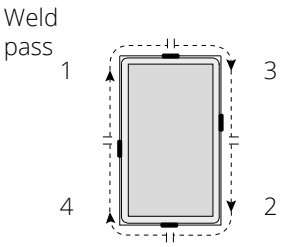


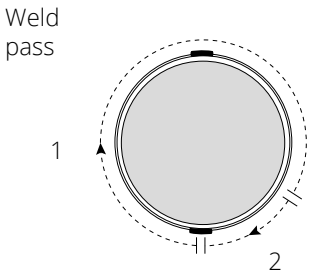
Horizontal MMA welding



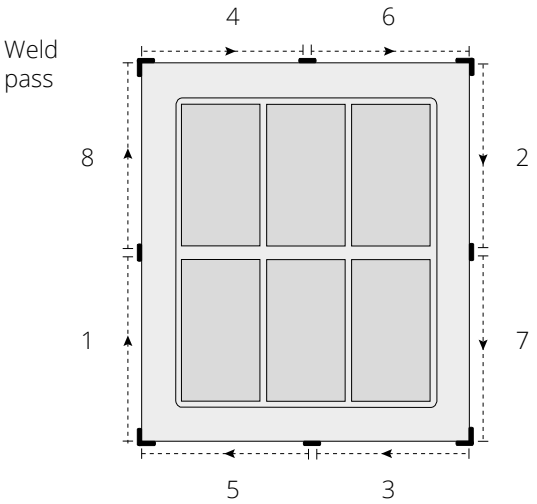
Horizontal MAG welding

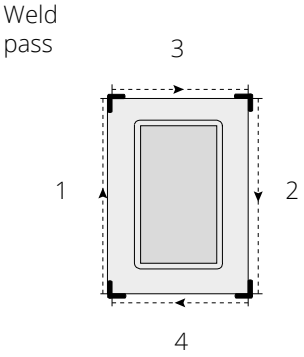


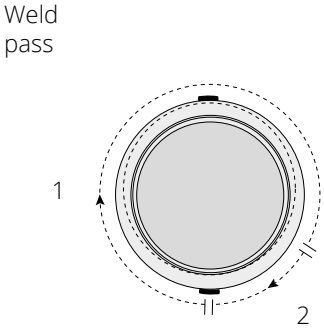




4.2 Weld passes – frames/sleeves with flange (horizontal weld)





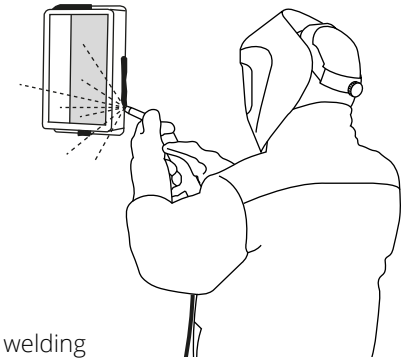


4.3 Weld passes – frames/sleeves without flange (vertical weld)

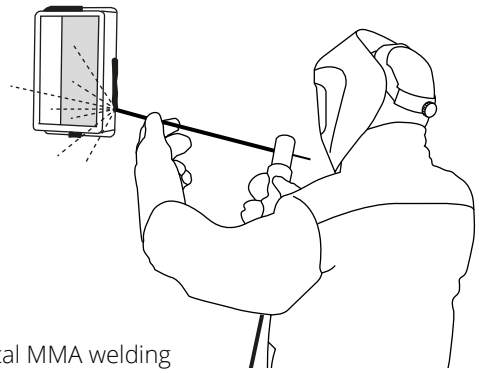
Ensure the frame or sleeve is fixed with a gap evenly around the circumference. Use filler metal approved for vertical welding in accordance with ISO 6947, position PG.

A 45° upward angle of the welding gun is recommended during the weld passes to ensure optimal weld quality and penetration.

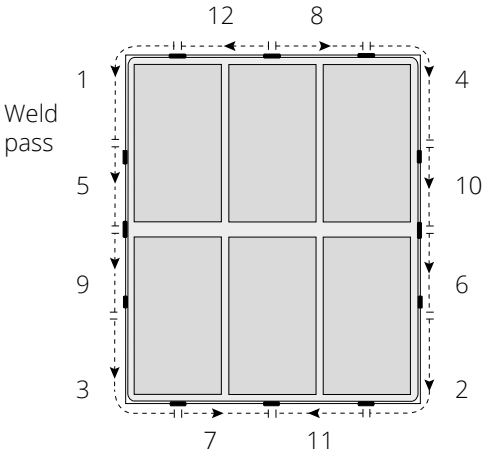
All welding must be performed by certified welders and in accordance with WPS, following the applicable local regulations.

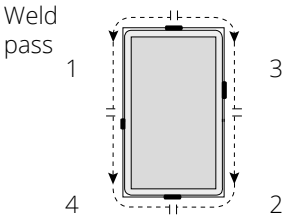


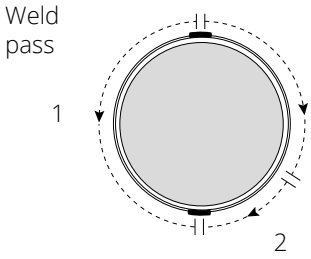
Vertical MAG welding



Vertical MMA welding

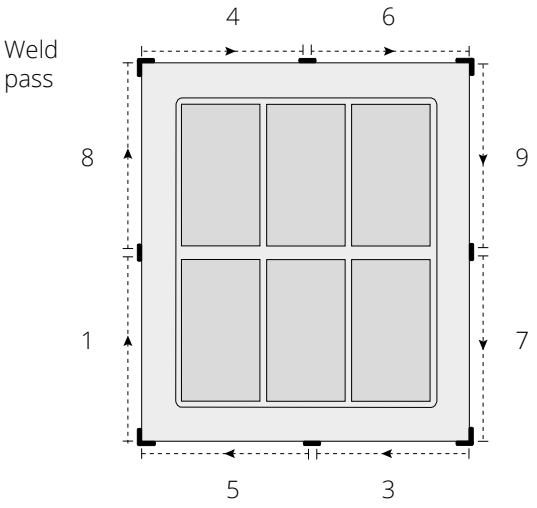


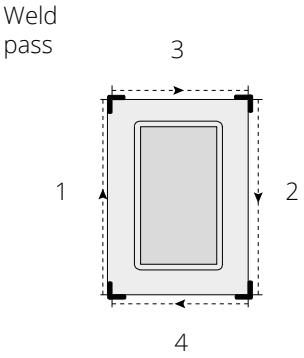


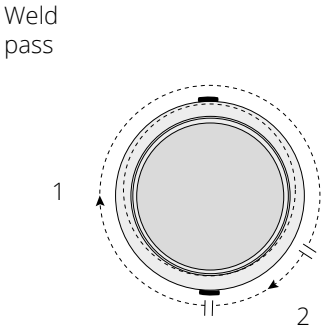


4.4 Weld passes – frames/sleeves with flange (vertical weld)

Ensure the frame or sleeve is securely fixed with a uniform gap around the entire circumference. Use filler metal that is approved for vertical welding (ISO 6947, position PG). A 45° upward angle of the welding gun is recommended for optimal weld quality and penetration.

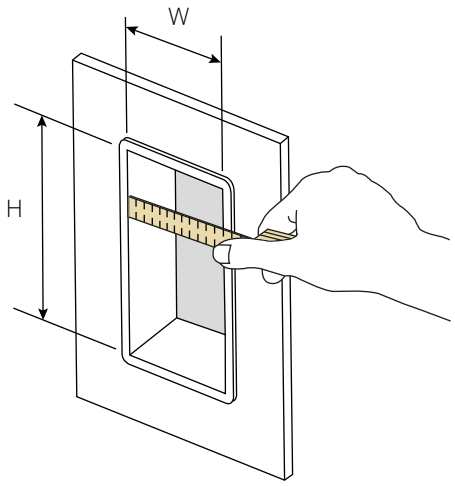


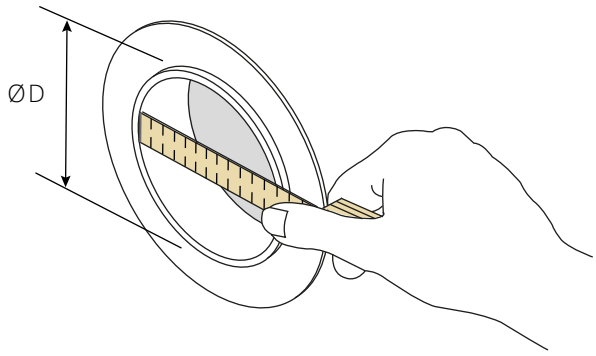




5 Measuring

Measure 10 mm into the frame depth on both the front and back sides according to the specified table after welding. Measurements should be taken when the frame or sleeve temperature is below 50˚C. Ensure that the caliper is not tilted during measurement to maintain accuracy.





Frame dimensions

Size	H (mm)	W (mm)
1	101 ±1	60,25 ±0,5
2	101 ±1	120,5 ±1
3	159,5 ±1	60,25 ±0,5
4	159,5 ±1	120,5 ±1
5	218 ±1	60,25 ±0,5
6	218 ±1	120,5 ±1
7	276,5 ±1	60,25 ±0,5
8	276,5 ±1	120,5 ±1

Sleeve dimensions

RGP TYPE	RGP ID MM
50	50-51
70	7071
100	100-102
125	125-127
150	150-152
200	200-202
300	301,5-304

Sleeve dimensions inches

RGP TYPE	RGP ID INCHES
RGP 2″	1,97-2,07″
RGP 3″	3-3,04″
RGP 4″	4-4,08″
RGP 5″	5-5,08″
RGP 6″	6-6,08″
RGP 8″	8-8,08″
RGP 11.8″	11,87-11,96″

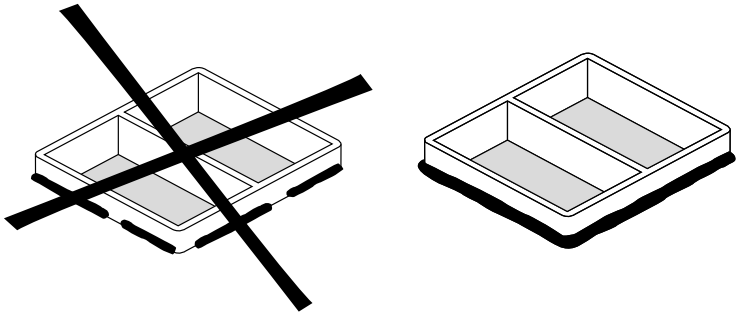
Note:
A frame exceeding the tolerance may not achieve full pressure withstand performance without additional considerations or re-installation. Please contact MCT Brattberg for consultation.

6 Caution

Although this guideline serves as a helpful reference for achieving safe welds, it is essential to be aware of potential errors that can lead to system failure. The following sections highlight examples of welding errors that should be avoided.

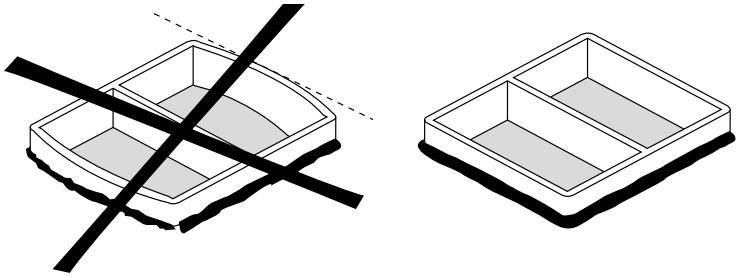
6.1 Intermittent welds

Ensure that weld seams overlap to maintain structural integrity and prevent weak points.



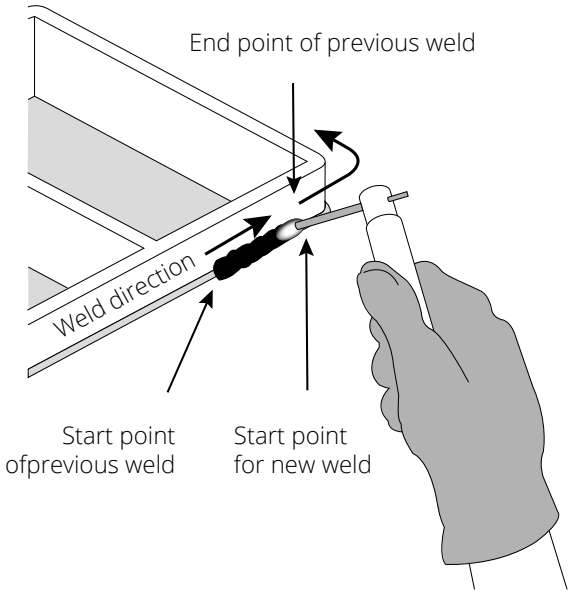
6.2 Exceeding recommended weld size

Excessive welding or excessive heat input can cause frame deflection, which may increase packing space and reduce compression in the sealing system.



6.3 Weld pass

Always start a new weld seam from the endpoint of a previous weld to ensure proper fusion and continuity.



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The MCT Brattberg cable and pipe entry sealing system ("the MCT Brattberg system") is a modular-based system of sealing products consisting of different components. Each component is essential for the optimal performance of the MCT Brattberg system. The system has been certified to withstand various hazards, and its certification, as well as its ability to resist such hazards, depends on the installation of all necessary components manufactured by or under license from MCT Brattberg ("authorized manufacturer"). Therefore, the certification is not valid and does not apply unless all installed components are produced by an authorized manufacturer.

MCT Brattberg provides no performance guarantee for the MCT Brattberg system unless:

- All components installed as part of the system are manufactured by an authorized manufacturer.

- The purchaser complies with the following conditions:
  (a) Storage – The MCT Brattberg system or its parts must be kept indoors in their original packaging at room temperature.
  (b) Installation – Installation must be carried out in accordance with MCT Brattberg's installation instructions in effect at the time of installation.

  The product information provided by MCT Brattberg does not exempt the purchaser from independently determining the suitability of the products for the intended process, installation, and/or use.

MCT Brattberg provides no guarantee for the system or any of its components and assumes no liability for any loss or damage, whether direct, indirect, consequential, or related to loss of profit. This applies to cases where:

Installations contain components not manufactured by an authorized manufacturer.
The system is used in a manner or application other than what it was designed or intended for.
MCT Brattberg expressly excludes any implied warranties of merchantability and fitness for a particular purpose, along with all other express or implied representations and warranties provided by statute or common law. The user is responsible for determining the suitability of the MCT Brattberg system for its intended use and assumes all risks and liabilities associated with it.

Under no circumstances shall MCT Brattberg be liable for indirect, consequential, punitive, special, exemplary, or incidental damages or losses.

MCT Brattberg products are offered and sold in accordance with the MCT Brattberg General Terms and conditions.

The latest version of these terms can be found and downloaded from:
https://www.mctbrattberg.com/documents/terms-and-conditions/