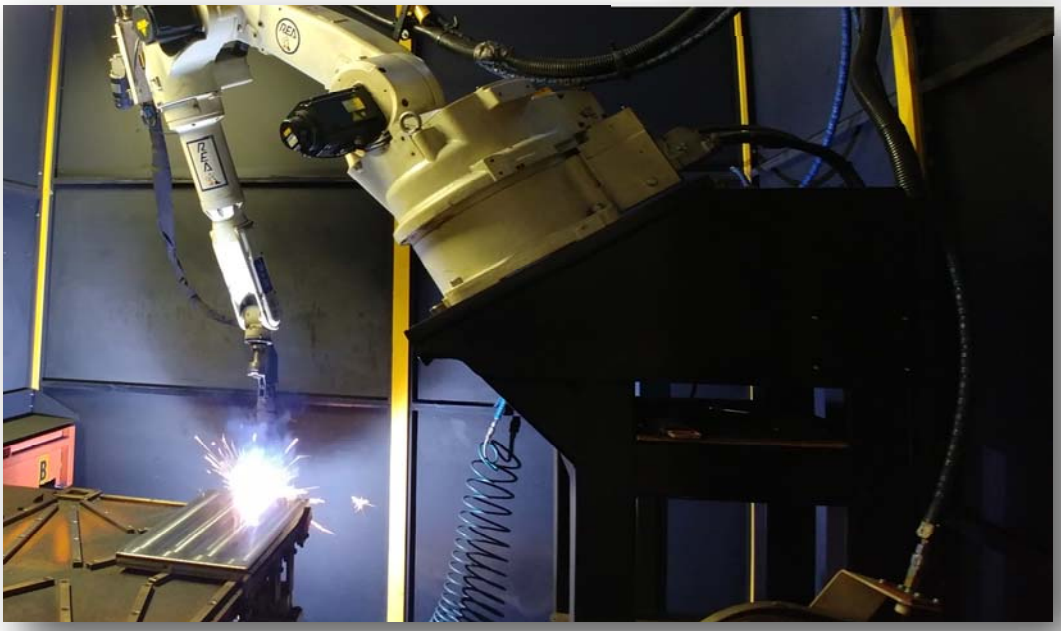
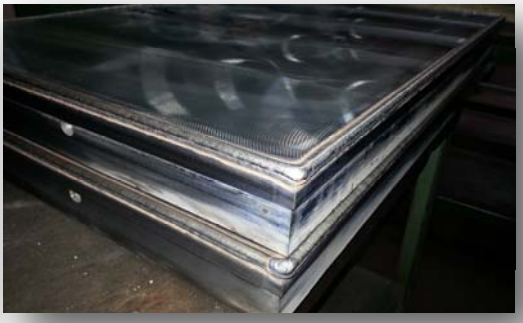
MALLOY

CERAMIC

Perfect welding





How to HARDFACE the Punches for Ceramic Tiles

HOW TO PROPERLY HARDFACE THE PUNCHES

In order to get the best SERVICE LIFE from the PUNCHES it is very important to use the best hardfacing welding wires like MALLOY 444 or 445 or 446, but it is also very important to correctly prepare the punches prior their welding and choose the best procedure to arc-weld them.

Flux Cored Wire	Punches service life	Machinability
MALLOY 444W Ø 1.2 mm	VERY GOOD (similar to wire STELLITE 6)	GOOD
MALLOY 445W Ø 1.2 mm	GOOD	VERY GOOD
MALLOY 446W Ø 1.2 mm	EXCELLENT (exceeding wire STELLITE 6)	BIT DIFFICULT

PUNCHES PREPARATION

Since the punches must be HIGH WEAR Resisting both on top and on the side of the edges (see Fig 1), it is very important to BEVELL the edges, to create enough space for the hardfacing beads to be added by welding (see Fig 2—Double layer on Bevelled Edges).

NOTE Hardfacing with just 1 bead directly on the edges not Bevelled will produce a punch with a POOR SERVICE LIFE !!!

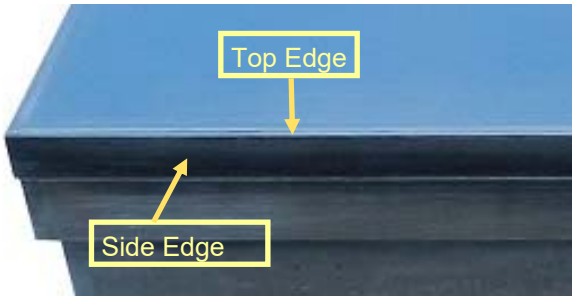


Fig 1– Finished Punch

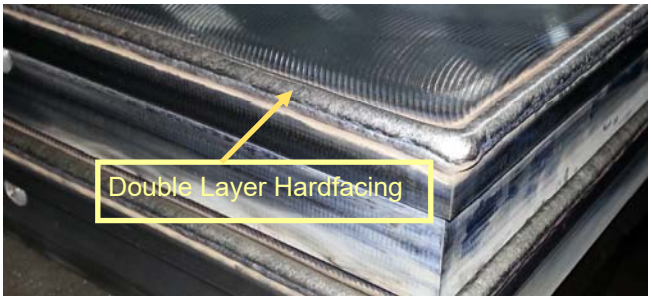
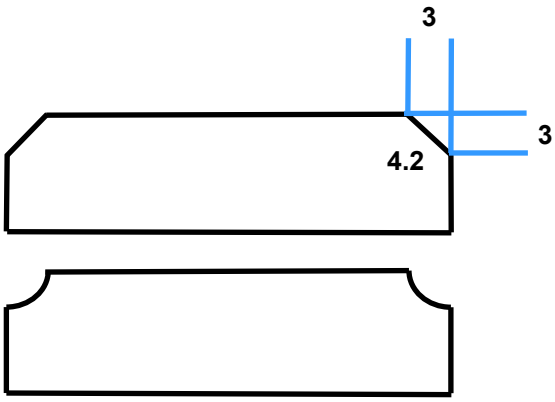


Fig 2– Double Layer on Bevelled Edges

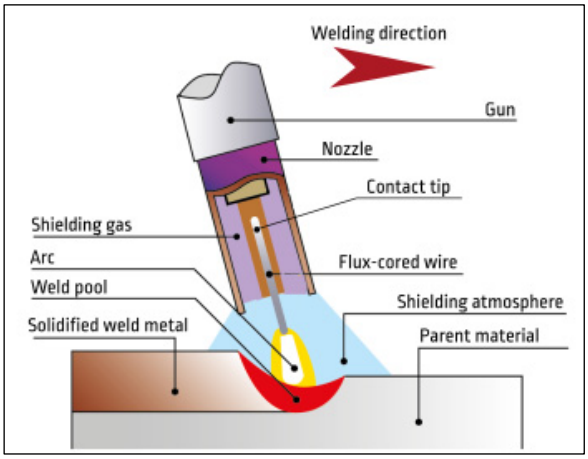
BEVELLING

The Edges Bevelling can be 45°, size 3x3 mm or more, Flat or C profile.



MIG WELDING

In MIG welding (or GMAW Gas Manual Arc Welding) the arc is formed in an gas shielding atmosphere between a continuously fed consumable wire electrode and the work piece. The ***Heat Input*** *depends on the metal transfer mode, which can be classified into short-arc transfer, globular transfer, spray transfer and pulse transfer. The operating parameters such as the arc voltage, current (or wire feed rate), shielding gas, control the transfer mode.*



Typical Welding Parameters Range

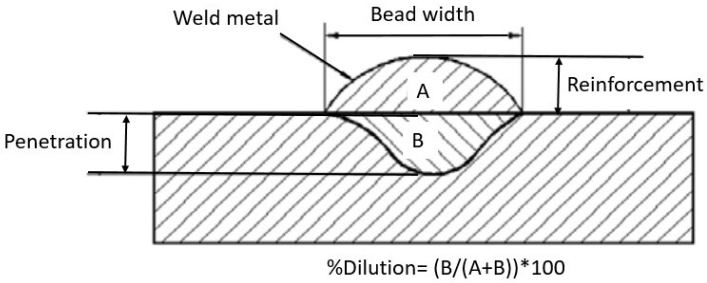
	Arc Current (Wire Speed)	Arc Voltage	Heat Input	Suitability for Hardfacing of Punches
Short Arc	65-170 A	15-20 V	LOW	YES
Globular Arc	180-260 A	20-25 V	HIGH	NOT
Spray Arc	250-350 A	25-38 V	VERY HIGH	NOT
Pulsed Arc	Pulsed	Pulsed	LOW	YES

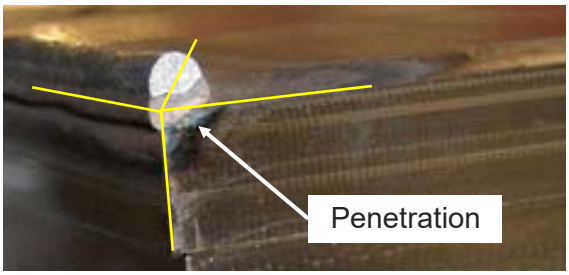
NOTE Pulsed Arc allows a higher welding speed than Short Arc, with a LOW Heat Input !!!

DILUTION

In fusion welding (due to the HEAT INPUT, that is the electrical energy supplied by the welding arc to the base metal) both the welding wire and the base metal melt, generating always a PENETRATION in the base metal. The penetration causes DILUTION.

The lower the heat input, the lower the penetration and dilution!





- Double layer on a bevelled edge

What is DILUTION?

Dilution is the extent of change in the chemical composition of the deposited weld metal (A), caused by the mixing with the melted base metal (B).

In hardfacing welding, it is desirable to decrease the dilution so that the chemical composition and the properties of the weld deposit, such as hardness and wear resistance, are less influenced by the properties of the base metal, generally inferior when regarding the wear resistance.

In the case of punches hardfacing, the portion B of the punch, which is carbon steel (C45), mixes with the portion A of the hardfacing welding wire, lowering its hardness and its volume carbides, thus its wearing resistance.

THE LOWER THE DILUTION THE HIGHER THE WEAR RESISTANCE OF THE PUNCH!

HOW TO REDUCE THE DILUTION to INCREASE THE WEAR RESISTANCE OF THE PUNCHES

In Mig welding with Short Arc transfer the amount of dilution is 15-30 % and is in part a result of the Heat Input.

$$\text{Heat Input} = \frac{A \times V \times 0.06}{S \text{ (Travel speed)}}$$

A is the welding current (wire speed)
V is the welding voltage
S is the travel or welding speed

Factors that affect dilution:

* ***Welding current A or wire speed*** *- Increasing the current, automatically increase the wire speed. The slower the wire speed, the lower the dilution! Suggested value: 100-130 Amp. This is the reason why it is always better to deposit small beads instead of big ones.*

* ***Welding voltage V -*** *The slower the welding voltage, the lower the dilution! Suggested value with Malloy wires: 15-17 Volts.*

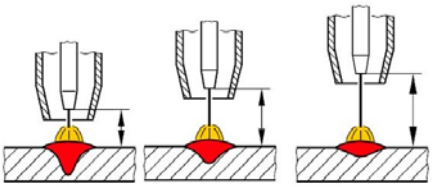
  NOTE- Flux Cored welding wires, been tubular, requires less current A and voltage V to melt, compared to solid wires of same diameters and chemical composition. This is the reason why Flux cored wires are the best choice for punches hardfacing. For the best performances use flux cored copper coated wire MALLOY 444-445-446!!

* ***Welding speed S -*** *The slower the welding speed (torch speed) the higher the dilution!*

* ***Numbers of layers -*** *As more layers are deposited, the total dilution decreases! In new punches at least two layers are applied on the bevelled edges! In worn punches to be regenerated, when it is not known how the previous weld was made, it is always preferable to remove the old edges and build the new ones with at least 3 or 4 layers.*

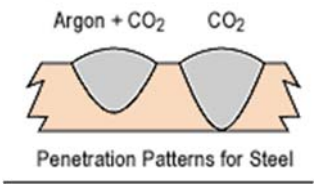
* ***Preheating -*** *Higher preheat gives higher deposit dilution. With MALLOY Flux cored wires, Preheating is not necessary!*

* ***Wire CTWD*** *- Shorter Contact Tip to Work Distance can drastically increase dilution. A distance of 10 mm is too low. To have low dilution, 15 mm is OK!*

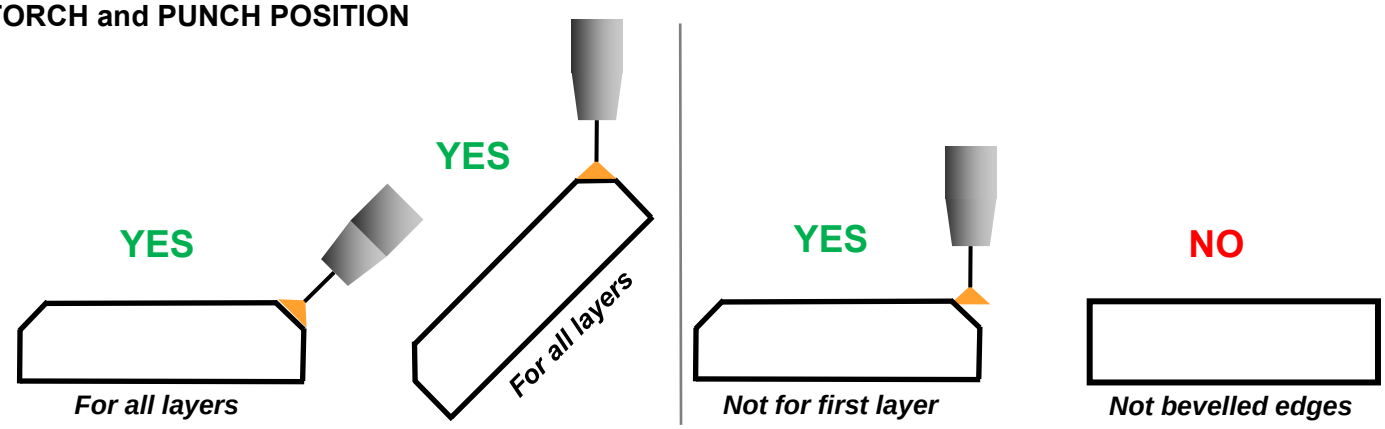


CTWD– Contact Tip to Work Distance

* ***Shielding gases -*** *Also the gas affect the dilution. Pure CO2 increases too much the penetration, thus the dilution. MIX Argon/CO2 is preferred. 82/18 % for Short Arc and 92/8 % for Pulsed Arc. Gas flow rate: 16-18 L/min.*



TORCH and PUNCH POSITION



POLIMAT Sas di Valentini & C. – Via S. Michele, 188 - 41049 Sassuolo (MO) - ITALY
Tel. +39 0536-852085 – Mobile **+39 335 8182947**
Web: www.malloy.it e-mail: polimat@tin.it ; info@malloy.it