

WisePenetration™

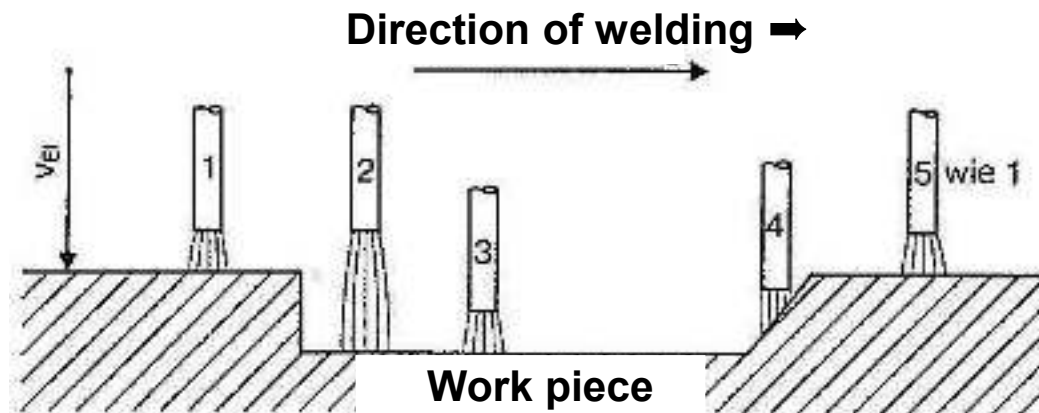
Welding function for ensured penetration



The theory of practice in MIG/MAG welding

In MIG/MAG welding one of the most commonly used characteristics is Constant Voltage (CV).

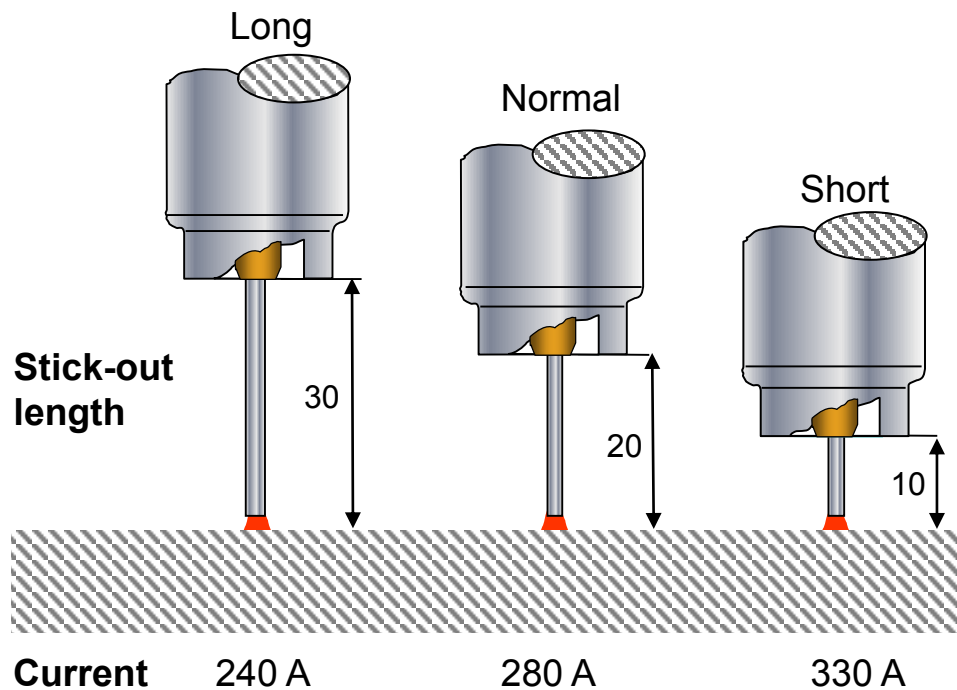
- Self-regulating arc (see fig.) is the most important argument for the use of constant voltage characteristics
- Stick-out length increase will cause the welding power to drop, because welding current decreases ($P = U \times I$).



The theory of practice in MIG/MAG welding

Stick-out length in CV characteristics:

When stick-out length is changing, wire feed speed and arc voltage stays at the set level. Current is changing according to the stick-out length.



Mild steel / solid Ø1.2 mm / Ar + 18%CO₂

Voltage	29.0 V
Wfr	8.8 m/min
Travel speed	58.0 cm/min

The practical welding problem

Welding current depends on the used stick-out length because of the use of Constant Voltage characteristics.



The longer the stick-out length is, the lower the welding current out will be.

This feature can cause serious welding defects such:

- Lack of fusion
- Incomplete penetration

Arc type can change: spray arc → globular arc

- Spatters

The practical welding problem

In manual MIG/MAG welding the stick out length varies depending on the welder's skills and this affects the weld joint penetration.

Sometimes the welder must increase the stick-out length:

- limited visibility or accessibility
- position welding
- Difficult-to-weld joints
- weld design problems etc.



The practical welding problem

In mechanised & automated welding, dimensional and geometrical deviations of the joints are causing variation in the stick out length.



- Deviations originated in all phases of the joint preparation and fit-up work
- Additionally, the distortion caused by the welding heat increases deviations during welding

Many of the joint tracking systems are expensive, and do not operate reliably in all welding conditions.

WisePenetration™

- **WisePenetration** is a function for synergic MIG/MAG welding (1-MIG)
- It ensures weld penetration in the cases where stick-out length suddenly increases temporarily.
- Without **WisePenetration** function, the stick-out length increase causes a welding current decrease. This may cause welding defects, such as lack of fusion or incomplete penetration.

WisePenetration™

- **WisePenetration** function prevents current from dropping down by actively adjusting the wire feeding. This helps to keep weld mechanical properties on a desired level and prevents welding defects.
- User sets the wanted current level. Current does not drop below this level when stick-out length increases.
- In **FastMig Syn** and **KempArc syn** this parameter is found in the setup menu option PEN. In **FastMig Pulse** and **KempArc Pulse** it's the 'Penet%' selection in advanced functions.

Function benefits & features

- Constant current → Ensured penetration → Avoid lack of fusion
- Complete penetration → Improved weld quality
- Arc is not affected by stick-out length variation → Reduced need for welding parameter adjustment → More efficient duty cycle
- LESS spatter and LESS repair → Saves time and costs.

Function benefits & features

- ON/OFF-function → Easy to use and learn / Helps welder to concentrate on his/her work (full focus on welding)
- Operate with short/long cables and short/spray arc → Wide area of operation
- Welder can weld within **WPS** limits.

Adjusting WisePenetration™

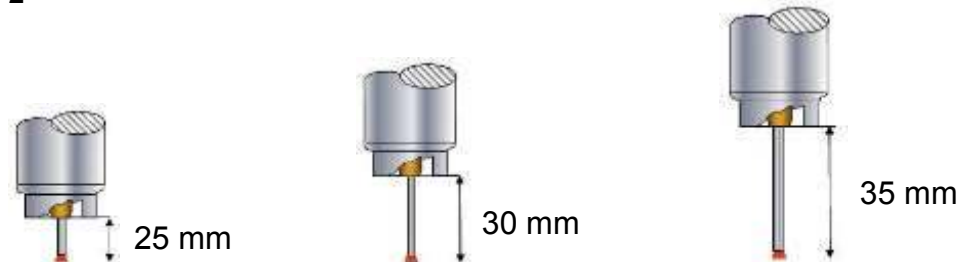
1. Choose the welding program according to the material, wire diameter and shielding gas. Note: WisePenetration works only in 1-MIG.
2. Set welding power to suit the work piece and the groove. Make a test weld without **WisePenetration**. Use correct stick-out length and adjust the welding parameters. If you use wrong stick-out length, the setup won't be correct for **WisePenetration**. Write down the test weld current from the panel (wire feed or power source).
3. Activate the **WisePenetration** function. Set Penet% -parameter so that the current value in the panel or the screen is close to the test weld current.
4. Make a new test weld using **WisePenetration**. Now wire feed should be faster with longer stick-out length than with the test weld without **WisePenetration** (step 2).

Test results

Mild steel / solid \varnothing 1.0 mm / Ar + 25% CO₂

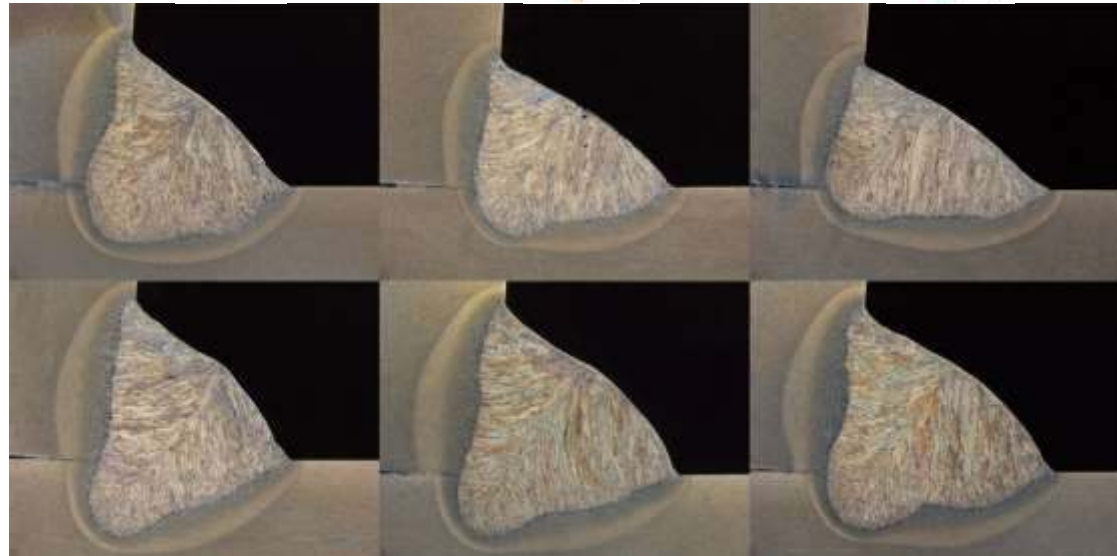
Voltage 35.0 V
Wfs 17.0 m/min
Travel speed 40.0 cm/min

STICK-OUT LENGTH



1-MIG

WisePenetration



Narrow structures where visibility of the arc is a problem



- Non-stop welding around a corner in narrow box. Stick-out length may vary because of the challenging construction.
- Welder increasing stick-out length because visibility of the welding arc and the weld pool is poor.
- WisePenetration ensures sufficient penetration even though the stick- out length increases.

Applications – manual welding



Volkswerft shipyard, Germany: Containers

A large, yellow and brown offshore oil rig structure, likely a jacket, is being lifted by a crane. The structure consists of a central vertical column and several diagonal legs. The central column is yellow, while the legs are brown. The structure is being lifted from a barge or platform in the water. The background shows a blue sky with white clouds.

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Applications – Deltabeam



- Last welds must be welded through the Deltabeam holes of diameter 80 to 150 mm. This means poor visibility to the joint.
- During welding the torch angle changes from pulling to pushing causing stick-out length variation.



Peikko Group, Finland: Deltabeam