

## WiseFusion™

Ensures optimum arc length



# Technical description

- **WiseFusion** is welding function for pulse and synergic MIG/MAG welding
- Idea is to keep welding arc focused so that arc density concentrates in a narrow area
- Adaptive arc length control keeps the arc always within the short circuit boundaries
- **WiseFusion** is a welding function for pulse and synergic MIG/MAG welding



*Video clip*

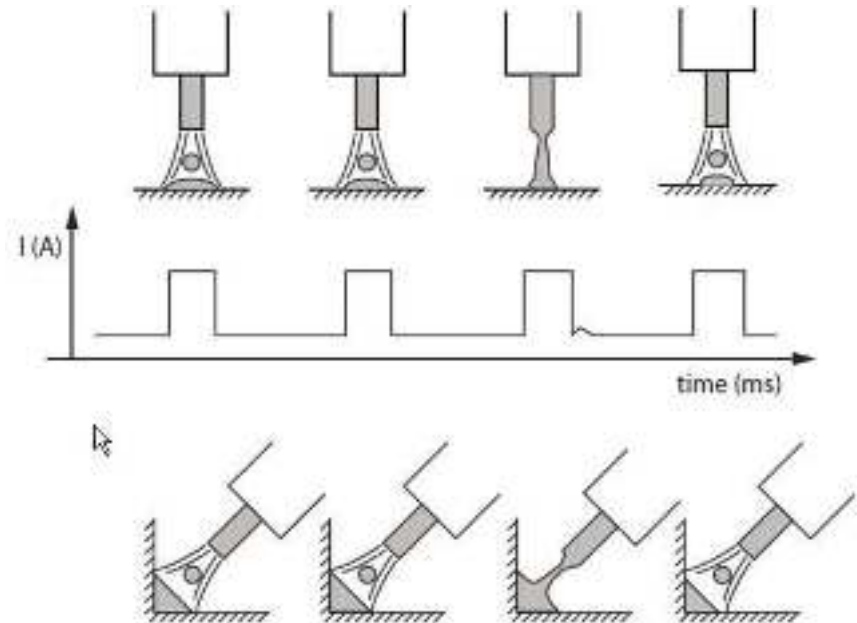


# Technical description

In pulsed arc **WiseFusion** % indicates how many short circuits there are in pulse sequences.

*Example: WiseFusion % is 25. Three out of four droplet detachments happen in open arc and one out of four in the short circuits.*

In synergic spray arc the power source calculates the short circuits continuously and keeps the wanted **WiseFusion** %.



# Function Benefits & features

## **Excellent weld pool control in position welding**

- Small weld pool
- Easy to weld in all positions

## **Narrow and energy dense arc**

- Good arc focusing
- Higher welding speed
- Narrow and deep grooves

## **No need for arc length fine tuning**

- Always the right parameters
- Easy to use



## Equipment needed

**WiseFusion** welding function is an optional software product for FastMIG M, FastMIG Pulse, FastMIG X, KempArc Pulse and KempArc TCS welding machines.

**WiseFusion** welding function is available for all pulse and synergic MIG welding programs.

# Function adjustments

**WiseFusion** welding function is switched on in power source setup panel (X, Pulse and Kemparc Pulse/TCS). In FastMIG M the function is switched on in the wire feeder



User can adjust the **WiseFusion** % from 10 % to 60 %. Default setting is CURVE.

**WiseFusion** % adjusts the percentage of pulses in short circuit or how long the arc is in short circuit in the spray arc.

# Applications



## Aluminium position welding

- Excellent weld pool control
- Easy to weld in all positions

## Challenging nickel based filler materials

- Wire sticks easily to the contact tip
- Arc length increases too much
- WiseFusion function keeps arc length optimally short



## High strength steels

- 15 % lower welding energy than in pulse MAG
- Narrow and well focused arc.

# AlMg5 position welding

Wfr 8 m/min, no fine tuning



*WiseFusion™*

*Normal pulse*

**Filler:** AlMg5 1.2 mm

**Plate thickness:** 3 mm

**Joint form:** T-joint

**Welding position:** Vertical  
fillet weld from down to up



# Aluminium boat



Inha mills, Finland

*Welder's comment:*

*"Possible to weld on the molten weld pool in 10 mm air gap"*



*Welding of Buster X aluminium boat.*

# Aluminium bus body

Kabus, Finland

*Welder's comment:*

*"Arc length is always correct"*



*Vertical rail of front spring.*

# Inconel 617 – challenging filler material



**Inconel 617 is nickel based solid wire for joining**

- High temperature and similar nickel alloys
- Heat-resistant austenitic and cast alloys

**Very challenging to weld**

- Wire easily sticks to the contact tip  
→ Arc length increases too much

**Welding Inconel 617 with WiseFusion™**

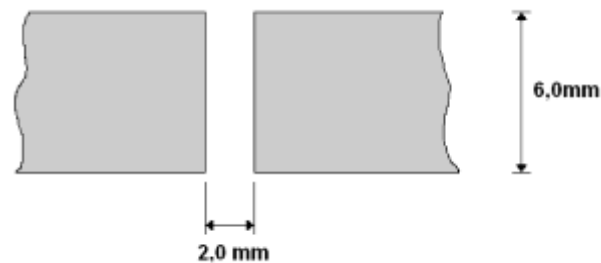
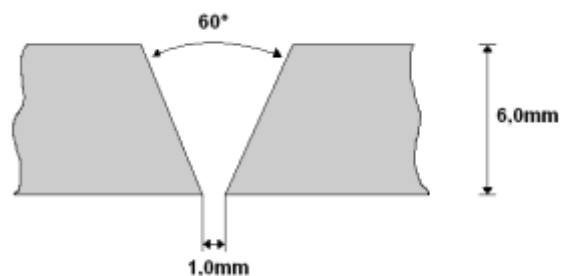
- Stable arc
- Arc length doesn't increase
- Better bead wetting

# Lower welding energy with WiseFusion™

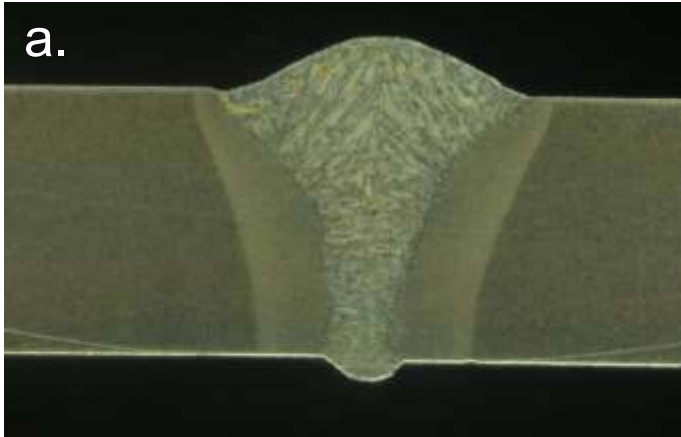
1. Lower welding energy
2. Possible to weld in narrow grooves
  - less filler material
  - lower welding energy

**Table 1.** Welding energy comparison.

Process	wfs [m/min]	P [W]	v [mm/min]	E [kJ/mm]	%
MAG (spray arc)	12	7800	450	1.04	21.79
Pulse MAG	12	6865	450	0.91	11.14
WiseFusion	12	6100	450	0.81	0



# High strength steels



- 15 % lower heat input than in pulse MAG
- Narrow and well focused arc
  - possible to weld in narrow grooves
  - smaller weld pool and lower heat input



## a) Pulse MAG with WiseFusion™

I-groove 2 mm root gap

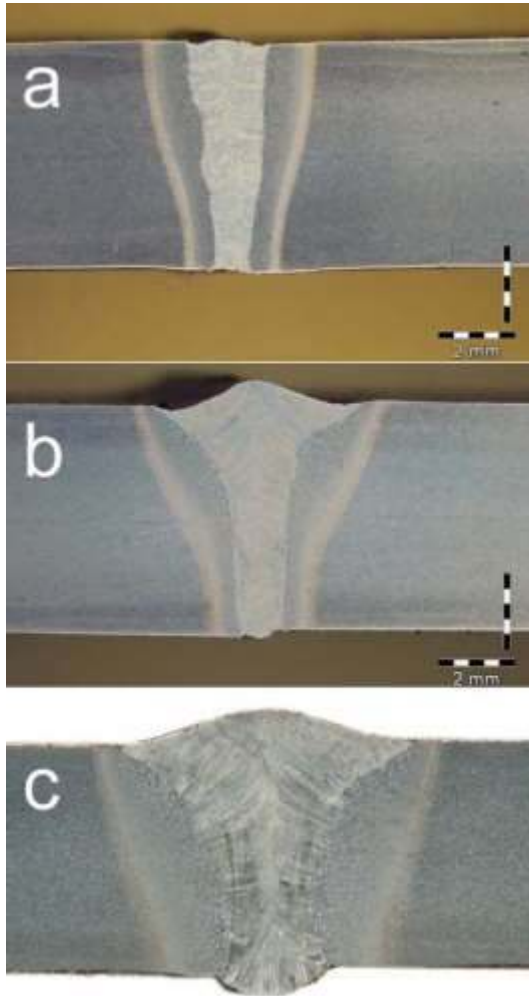
Heat input 0.39 kJ/mm

## b) Pulse MAG

40° V-groove 1 mm root gap

Heat input 0.76 kJ/mm

# Welding of high strength steels



1. Choosing of welding process
  - a) Laser
  - b) Laser + MAG (Hybrid)
  - c) Pulse MAG
2. Right conduct of welding and high quality
3. Choosing of filler material
  - Under matching
  - Matching
  - Over matching
4. Right welding parameters (Welding energy E)

# Welding of high strength steels with WiseFusion™



[WiseFusionButtJoint.wmv](#)



# Welding tests with WiseFusion™

1 pass



40° V-groove

Wfs 16 m/min  
Current 265 A  
Voltage 27.9 V

Welding speed 650 mm/min  
Welding energy 0.73 kJ/mm

$R_{p0,2}$  957 MPa

1 pass



I-groove

Wfs 16 m/min  
Current 260 A  
Voltage 28.5 V

Welding speed 800 mm/min  
Welding energy 0.58 kJ/mm

$R_{p0,2}$  981 MPa

2 passes



40° V-groove

Wfs 12 m/min  
Current 225 A  
Voltage 25.4 V

Welding speed 1200 mm/min  
Welding energy 0.33 kJ/mm

$R_{p0,2}$  1002 MPa



# Mechanical properties with WiseFusion™



E  
R<sub>p0,2</sub>

0.73 kJ/mm  
957 MPa

## Impact energy -40°C

Weld	37 J
Fusion line+1mm	55 J
Fusion line+3mm	42 J



E  
R<sub>p0,2</sub>

0.58 kJ/mm  
981 MPa

Weld	28 J
Fusion line+1mm	55 J
Fusion line+3mm	41 J



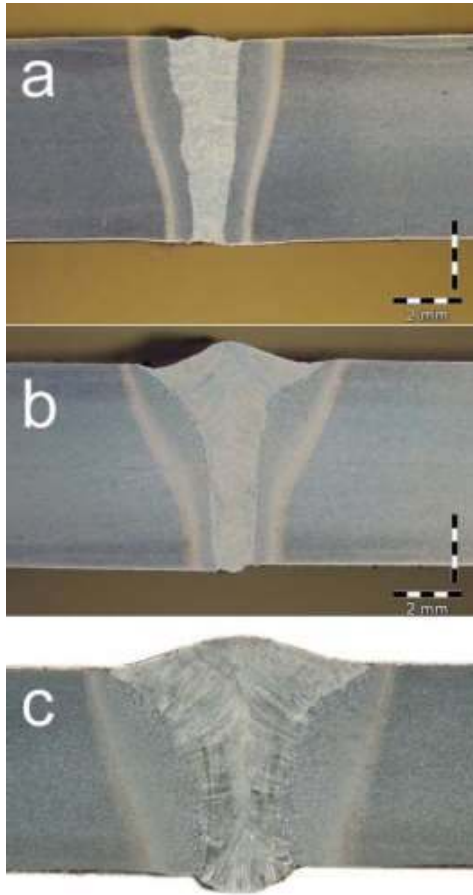
E  
R<sub>p0,2</sub>

0.33 kJ/mm  
1002 MPa

Weld	15 J
Fusion line+1mm	39 J
Fusion line+3mm	51 J

# Welding process comparison

Base material Optim 960 QC 6mm



## a) Laser

Welding speed	1.2 m/min
Welding energy	0.26 kJ/mm
Yield strength	1024 MPa

- + Low welding energy
- + Small distortion
- Small groove tolerance
- Expensive

## b) Laser + MAG (Hybrid)

Welding speed	2.0 m/min
Welding energy	0.35 kJ/mm
Yield strength	979 MPa

- + Low welding energy
- + Small distortion
- + High productivity
- Challenging process
- Expensive


## c) Pulse MAG with WiseFusion


Welding speed	0.8 m/min
Welding energy	0.59 kJ/mm
Yield strength	981 MPa

- + Cheap
- + Easy process
- + Also manual welding
- Lower energy density
- Lower productivity

# Conclusion


## Adaptive arc length control - WiseFusion™

- 
- Excellent weld pool control in all positions
  - Narrow and energy dense arc
  - No need for fine tuning

- 
- Always the right parameters
  - Higher welding speed
  - Good arc focusing
  - Lower heat input
  - Uniform quality
  - Easy to use



**Productivity**



**Quality and efficiency**