

The InFocus welding technology starts where TIG standard solutions reach their limits. Due to the heavily constricted arc it is possible to join in a cost-efficient manner nearly all steel types and non-ferrous metals with material thicknesses ranging from thick to thin. The process-stable joining produces an even seam surface of high quality. Thus, this TIG process is predestined for automated applications in areas like the vehicle and automotive industry (e.g. chassis and exhaust systems), in pipeline and container construction or in sensor and medical engineering. InFocus means automated TIG welding at the highest level.

Advantages at a Glance

- Sheets with a thickness of up to 10 mm (single-layer)
- Nearly all steel types, non-ferrous metals (e.g. copper, aluminium, zinc) as well as galvanised sheets
- 3 torch types for different requirements on accessibility
- Robust torch with connected cooling circuit
- Process-stable and spatter-free
- Quick change of cathode with defined torch position (TCP – tool centre point $\pm 0,1\text{mm}$)
- Multiplied welding and soldering speed
- High quality of the weld, small heat-affected zone, low distortion
- Good inert gas coverage
- Helium demand reduced in many cases or helium completely replaced

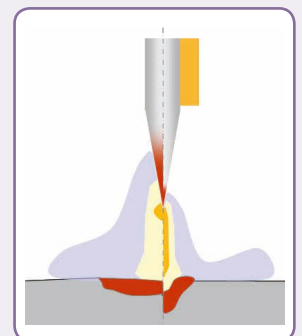
InFocus – Technology and Application

InFocus is a high-performance TIG arc welding technology for automated applications. Due to the maximised cathode cooling, the arc is constricted at the cathode tip in such a strong way that the special arc properties, process and joint properties are achieved and the joining of nearly all steels and non-ferrous metals with a material thickness between 0.15 – 10 mm (one layer) is made possible. The innovative torch design allows a quick change of consumables and a defined position of the cathode tip (TCP – tool centre point) without additional adjustment. InFocus is one of the most flexible joining processes because it covers a wide range of materials and thicknesses that can be processed. The multiplied welding speed and the short downtimes make the spatter-free InFocus process more economical than conventional TIG welding. Compared to laser welding, there are considerably lower investment and operating costs.

In contrast to plasma welding, InFocus works without an arc-forming nozzle and the ignition takes place directly towards the work-piece. An additional consumable is no longer required and the large number of influencing factors and parameters which is typical for plasma welding can be reduced considerably.



InFocus welding process



Comparison TIG- and InFocus-technique (right)

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The following welding tasks can be carried out:

Welding of thin-walled profiles, thin sheets and foils ■■■

In many cases, the classical TIG process is used for welding thin materials. In contrast to these conventional processes, InFocus makes it possible to increase the welding speed considerably at excellent seam quality. Thus, thin sheets and foils can be joined to the best advantage and with laser-like quality without the use of filler materials. The gap tolerance is similar to the conventional process. Welding with wire is also possible.

From a material-dependent minimum sheet thickness it is also possible to produce a keyhole as an alternative to heat conduction welding. It is thus possible, for example, to join unalloyed steel profiles with a material thickness of 2 mm under production conditions and at welding speeds of up to 15 m/min.

Full-attachment welding and root welding for sheets up to 10 mm ■■■

The InFocus keyhole welding technology allows the process-stable, single-layer welding of sheets at highest quality (mild steel up to 6 mm, CrN steels up to 10 mm). For this purpose, it is recommended to have a defined, material-dependent joining gap. The constricted arc produces plasma-like arc properties. The result: a narrow weld with an excellent depth to width ratio. The low energy input reduces distortion and residual stress and creates extraordinarily good mechanical properties of the weld.

The InFocus keyhole welding process is robust and process-stable and, with adjusting only a few parameters, allows welding speeds that are considerably higher compared to plasma welding. Therefore, InFocus keyhole welding is also especially suited for root welding of thicker sheets with subsequent filler and cover layer processes like the SA welding process. After InFocus root welding, the enlarged root face of the seam root forms a stable backing for the first filler bead. The higher root face reduces the weld cross section which has to be filled and, therefore, the consumption of filler materials, the production time, the energy input into the work-piece and, thus, distortion. The gouging after conventional GMAW root welding is no longer necessary.

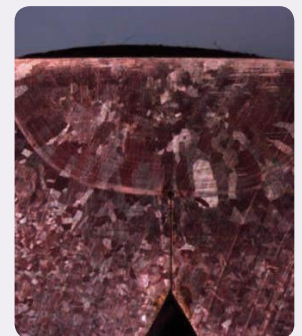
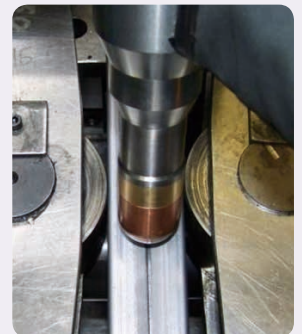
Welding of sheets and plates of non-ferrous metals ■■■

The concentrated energy input of the InFocus arc opens up new possibilities for welding non-ferrous metals. Due to the high energy density created by the InFocus torch, a concentrated weld pool is forced and a deep penetration created also in case of thermally well conductive non-ferrous metals (in particular copper and aluminium alloys).

The InFocus technology can be used to weld thin copper sheets, e.g. with a material thickness of 0.6 mm, as well as thick copper plates, partly without pre-heating. During the spatter-free InFocus welding of aluminium sheets with a material thickness of 0.7 mm welding speeds of up to 10 m/min and a perfect seam surface can be achieved. Apart from a few exceptions, welding is done without adding wire in these cases. Also titanium alloys for aerospace applications were already processed successfully.

Soldering and welding of galvanized sheets ■■■

During InFocus soldering and welding of galvanized sheets, laser-like seams at a speed of 4 m/min could be achieved. The zinc layer besides the soldered seam and at the bottom side of the sheet is preserved. The energy distribution within the arc provides a pre-heating effect on the edge zones and ensures a good wetting of the work-piece with the solder. For high-quality soldered joints in the visible area we recommend the use of a dynamic seam tracking system. During welding, the zinc layer is affected only directly besides the seam in a very narrow area – this area is significantly narrower compared to conventional TIG processes.



Top down:
Welding of square rolled sections;
key-hole weld Y seam with root face
of 8.0 mm on steel and copper

The InFocus Torch as Carrier of the Technology

The torches of the InFocus series are unique due to the special design of the cathode. Due to an optimised water cooling and minimised electrical and thermal resistances, the constriction of the arc at the cathode tip is forced, thus increasing the energy density in the arc many times over.

InFocus 1000 AX and InFocus 1000 RD – powerful with 1000 A ▬▬▬

The torches InFocus 1000 AX and InFocus 1000 RD realise high-performance arcs with currents up to 1,000 Amperes. They are different with respect to an axial (AX) or radial (RD) connection to the hose parcel.

InFocus 500 – small and manoeuvrable with 500 A ▬▬▬

In many areas of automated welding, the choice of an appropriate process and torch is restricted by limited accessibility. In order to make the InFocus technology available also for such welding applications, we developed the TIG welding torch InFocus 500 as the little brother of the InFocus 1000. The combination of compact design (with a diameter of only 20 mm) and high performance makes the InFocus 500 an unbeatable tool in filigree production processes.



Welding torches InFocus 1000 AX (left), InFocus 1000 RD and InFocus 500

Technical Data of the Torches

	InFocus 500	InFocus 1000 AX	InFocus 1000 RD
Maximum ampacity	500 A	1,000 A	
Welding current at duty cycle	500 A / 100 %	1,000 A / 100 %	
Protection gases	Ar, He, mixtures		
Ignition	High-voltage ignition		
Torch cooling	Coolant: Kjellfrost		
Clamping diameter	Ø 20/23 mm at shaft transition	Ø 48 mm at torch shaft	Bolt circle 41 mm, 6 x M5
Mass without hose parcel	260 g	1,200 g	

Equipment for Welding with InFocus Technology

As power supply Kjellberg offers the two power sources FocusTIG 500 AC/DC and FocusTIG 1000. Alternatively, also other standard TIG power sources can be used. The InFocus torch is connected to the power source and the heat exchanger via a connecting adapter.

The torch is basically cooled via a powerful heat exchanger with a cooling capacity of at least 2.3 kW at an ambient temperature of 15 °C.

Technical Data of the Power Sources

Welding system	InFocus 500	InFocus 1000
Power source	FocusTIG 500 AC/DC	FocusTIG 1000
Adjustment range of welding current	5 – 550 A	10 – 1,000 A
Adjustment range of welding voltage	10.2 – 32 V	10.4 – 34 V
Ambient temperature	-20 °C – 40 °C	-25 °C – 40 °C
Welding current at 25 °C (ambient t.)		
80 % duty cycle	520 A	1,000 A
100 % duty cycle	450 A	900 A
Welding current at 40 °C (ambient t.)		
60 % duty cycle	550 A	1,000 A
100 % duty cycle	420 A	750 A
Open-circuit voltage	79 V	
Mains voltage (tolerance)	3 x 400 V + N + PE (-25 % bis +20 %)	
Frequency	50/60 Hz	
Mains fuse (slow)	3 x 35 A	3 x 50 A
Maximum connected load	22.2 kVA	43 kVA
Recommended generator power	39.4 kVA	58.0 kVA
cos φ	0.99	
Insulation class	H	
Protection class	IP 23	
Dimensions (L x W x H)	1,080 x 690 x 1,195 mm	1,485 x 460 x 930 mm
Mass	186 kg	213 kg
Built in accordance with standard	IEC 60974-1, -3, -10, S-sign, CE-sign	

Welding Parameter Software Set

The TIG welding power sources FocusTIG 500 AC / DC and FocusTIG 1000 can either be parameterised by means of a welding parameter software or operated via an interface at operation with external setpoint input.

The software set* (supply includes: USB stick with software, data cable between welding power source and PC as well as an adapter) allows the complete parameterisation of the power source via the PC. Up to 510 jobs can be managed in a database and easily backed up to an external storage medium.

Operation with external setpoint input is optionally via an analogue or digital BUS interface (e.g. PROFIBUS, PROFINET, EtherCAT, etc.).

* System requirements: Windows 7 (32/64 Bit), Windows Vista, Windows XP SP3, installed .Net-Framework 2.0 (can be installed if necessary); Intel Pentium (or similar) CPU with at least 1.7 GHz; at least 512 MB RAM; at least 300 MB free hard disc space; USB 1.1 or USB 2.0 for installation of software; USB 1.1 or USB 2.0 port for connection to welding system

Optional Interfaces

The following interfaces can be selected additionally:

- Robot interface **RINT X12** – the digital standard interface for automated applications
- Industrial bus interface **BUSINT X11** – the solution for integration into automated production processes, e.g. with CAN-OPEN, DEVICE-NET, INTERBUS, PROFIBUS