

# VISION ZERO

## ZERO Explosion Risk in Oxyfuel Cutting and Welding

VISION ZERO  
PRACTICE



# ZERO Explosion Risk in Oxyfuel Cutting and Welding

## Author

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## Product Innovation S.A.T. System – the leakage guard in oxyfuel cutting and welding

Messer Cutting Systems is a German manufacturer of high-quality and efficient oxyfuel equipment and a partner of Vision Zero. In 125-year company history, the main target of the global product development has always been, to increase the safety as well as health and wellbeing in the use of oxyfuel equipment with all applications and in all working places. As in general oxyfuel is a high-risk substance, the challenge has always been: “Is it possible to reduce the explosion risk to Zero in oxyfuel cutting and welding?”

Vision Zero and its 7 Golden Rules inspired our product innovation team to re-think our technological solutions. The “7 Golden Rules” of Vision Zero provide guidance to re define the role as manufacturer and supplier and to deliver or sell not only technical equipment but to supply our customers a solution.



Additionally, we had a look on accidents and injuries on a global scale regarding the use of oxyfuel equipment. The documented numbers of accidents are not as high as with other applications, but in case of an accident, the consequences are mostly massive.

That is the reason, why education and training programs in all industrial sectors are common to control those risks and to ensure a higher level of safety in the working environment. The analysis of accidents which have been reported to us, which has been done in cooperation with our global partners, such as Gas Safety International (GSI) in South Africa, resulted in the following accident causes:



In 78 % of all analysed cases “Human Behaviour” was involved significantly. What can we take away from this information and what are the consequences for the process safety?

Of course it is necessary to further reduce mechanical failures, but this alone is not sufficient. We must improve at the same time the human behavioural factor, and this means substantial competence development of the qualified workers is essential. The risk awareness of the specialists at the workshops must be developed – and this means training and motivation are required.

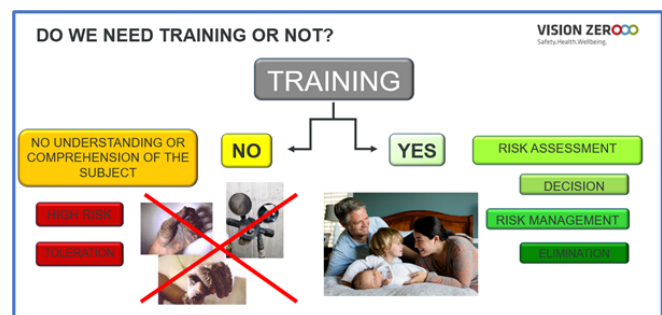
In this respect, the 7 Golden Rules of Vision Zero are the right eye-opener – for manufacturers as well. We are together with our customers in industry in the same boat and have an important role to play: Manufacturers have to share the responsibility for the workers onsite and have to care for a well- design safe and healthy process.

“ **The risk awareness of the specialists must be developed – and this means training and motivation are required.** ”

Suppliers must follow the 7 Golden Rules:

- ⇒ *Golden Rule 1 for Suppliers:* We must accept our responsibility and show our commitment for the industry and for the workers. It is not enough to say, “The worker made a mistake”. We are part of the system.
- ⇒ *Golden Rule 2 for Suppliers:* Of course, we must do our best to collect information about accidents and diseases in industry with a link to our technology. This is a challenging issue as nobody likes to report bad things. We must sensibelize our customers and our dealers to inform us about near-misses, damages and accidents. Probably it would be useful, to invite major customers with the special focus of safety and discuss issues around a table in a systematic way.
- ⇒ *Golden Rule 3 for Suppliers:* It is recommended that safety, health and wellbeing should be a strategic topic in our internal production processes but should not end there. Manufacturers should therefore live the Vision Zero approach internally, but as well transport it together with the sold products to the industry. This is the way to develop from a mass-producer to a system-supplier.
- ⇒ *Golden Rule 4 for Suppliers:* Delivering products, suppliers must analyze all possible health and safety risks in a systematic way and choose the right recommendations for safe and healthy use of their product at the workplace. This includes to deliver a safe product, but as well to recommend safe procedures, necessary personal protective equipment, to deliver comprehensive, informative and easy to understand operating manuals as well as practical training and instruction offers to assure that workers become competent regarding safe use of the product.
- ⇒ *Golden Rule 5 for Suppliers:* This is the most important rule for suppliers as everything starts with a well designed and produced technical product. It is essential to include in the design phase all possible situations for troubleshooting, maintenance and repair as those are the most critical operating conditions.

- ⇒ *Golden Rule 6 for Suppliers:* This Golden Rule is all about developing, improving and ensuring the competence, which is required for the technical product. Training, as practical as possible and demonstration of the use are essential. Videos, training kits and instruction materials should be delivered.
- ⇒ *Golden Rule 7 for Suppliers:* This is about dialogue with workers and managers. Suppliers can develop incentives for workers and frontline managers to achieve a relation built on trust. This will help to motivate workers and managers to communicate positive and negative experience with the product at an early stage.



Based on the Vision Zero Philosophy, Messer Cutting Systems together with all global partners works hard to provide safe products as well as proper knowledge transfer and safety training for all oxyfuel products.

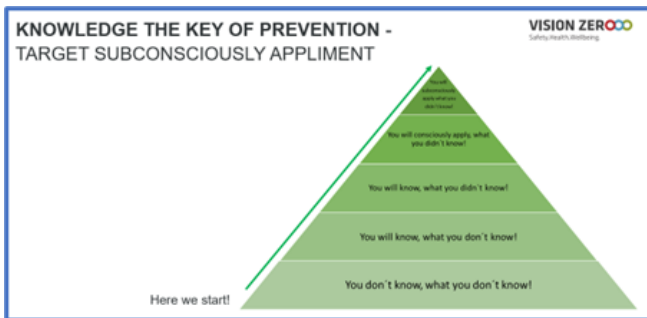
Depending on the product function, country specific standards, guidelines and requirements many countries have implemented good systems and tools to guarantee safety and health working with oxyfuel equipment. Examples are shown in the following table:

SAFETY AND HEALTH IN REGARD TO OXYFUEL EQUIPMENT FUNCTION, MAINTENANCE AND REPETITIVE CHECK
• Safety regards to mixing system, e.g. injector system save for gas backflow compare to equal pressure system
• Confirmed and certified product quality, e.g. by BAM
• „Repetive check of working equipment“ by a qualified person according to the Ordinance of industrial safety and health, DGIUV-guidelines 500 Chapter 2.26
• Check of the equipment for proper conditions, function and tightness against atmosphere by the worker before use

But, even if all safety instructions and procedures are handled correctly, there was still one risk remaining: the potential of a leakage in the fuel gas hose. Regarding to the low percentage of fuel gas needed to create an explosive mixture with the surrounding air (Acetylene 2.3%, Propane 1,7% and Methane (Natural gas) 4,4% in air), this risk is significant, when the work takes place indoors. The highest risk levels are reached while working for example in mines or in ships.

The hoses can have a length up to 200 meter and can't be checked completely before starting the daily work or during the work process by the worker. Those leakages have been the reason for many explosion accidents and fires in the past and still are.

For Messer Cutting Systems and GSI South Africa, the potential for those accidents was the reason, to focus the product development on a brand-new solution for a leakage proof system. The goal was to develop a safety device where even in case of massive damage no fuel gas will get out of the system to the atmosphere, resulting in fires or explosions.



Outcome of this development is the launch of the brand-new innovative S.A.T. System (S.A.T. stands for Safety Advanced Technology) – it provides the highest safety level and fuel gas is no more able to get out of the hose to the surrounding atmosphere. The patent pending System consists of a valve installed at the pressure regulator and a special developed cutting torch. This torch creates a defined negative pressure, which opens the valve and guarantees that there is never a positive pressure inside the hose. There is no longer a risk through small defects, loosened connections or damages of the hose. Escaping fuel gas can no longer get into gloves or sleeves. In case of a bigger defect or the torch doesn't work as intended, the negative pressure inside the hose drops and stops the gas flow immediately. The user is now aware that there is a defect and can react.

## Resume

Messer Cutting Systems and GSI South Africa work together to constantly improve this essential technology of oxyfuel cutting and welding. Inspired by the Vision Zero Strategy we came to optimized technological solution to reduce explosions and fires during the process to ZERO.

The new product is now available and must be used in industrial workplaces. Messer Cutting Systems and GSI South Africa follow all “7 Golden Rules for Suppliers” of VISION ZERO – we are convinced that the role of worldclass supplier is more than selling a cheap mass product – we want to be a reliable system partner for the industry. We strongly believe that ZERO accident in cutting and welding by oxyfuel technology is not an illusion but it is possible - our commitment is based on VISION ZERO and the 7 Golden Rules.

**SAFE, SAFER, S.A.T. SYSTEM**  
Safety Advanced Technology: stopping gas supply in the case of leakage

**PRODUCT**

**Advantages of S.A.T. System. Brief overview:**

- Huge improvement in safety for the user moving safety to new levels
- Detects leaks and damages to the hose assembly beyond the S.A.T. valve
- Eliminates the risk of leakage by stopping the gas supply
- User notices leakage in the hose line as the gas supply is stopped and the flame will extinguish
- Available with internationally common connections in: 3/8" BSP, 9/16" UNE, M16x1.5mm
- ECO S.A.T. nozzles available for acetylene and propane
- High level of simplicity during nozzle exchange owing to the quick release exchange system at the torch head
- Available with different hand cutting torches and/or welding or brazing torches
- Excellent adjusted flame. Little need for the user to readjust the flame



**This article was presented at the A+A 2023 held in Düsseldorf from 24 to 25 October 2023.**

**A publication of the International Section of the ISSA on Information for Prevention.**

**Published in 2024.**