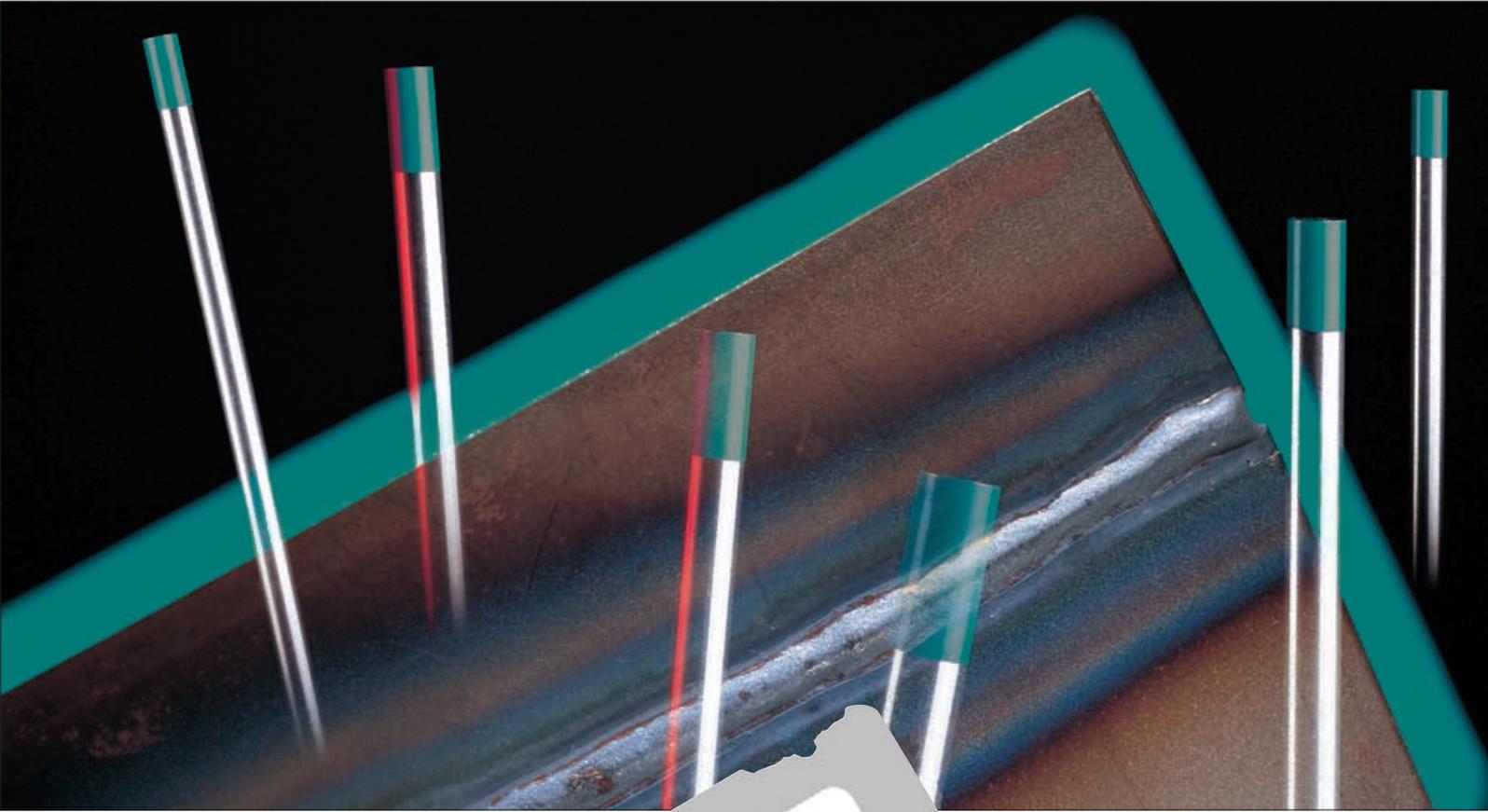


# Tungsten Electrodes WITSTAR®



# The problem with “Red” electrodes

Tungsten electrodes are used for **Tungsten Inert Gas welding (TIG)** and also for plasma welding and cutting. In order to improve the service life and arc striking characteristics of the popular **WT** types of electrode conforming to DIN/EN 26 848, **thorium oxide** is added to them during manufacture:

 <b>WT10</b> yellow	0,9 .. 1,2% ThO <sub>2</sub>
 <b>WT20</b> red	1,8 .. 2,2% ThO <sub>2</sub>
 <b>WT30</b> purple	2,8 .. 3,2% ThO <sub>2</sub>
 <b>WT40</b> orange	3,8 .. 4,2% ThO <sub>2</sub>

## Thorium oxide is slightly radioactive

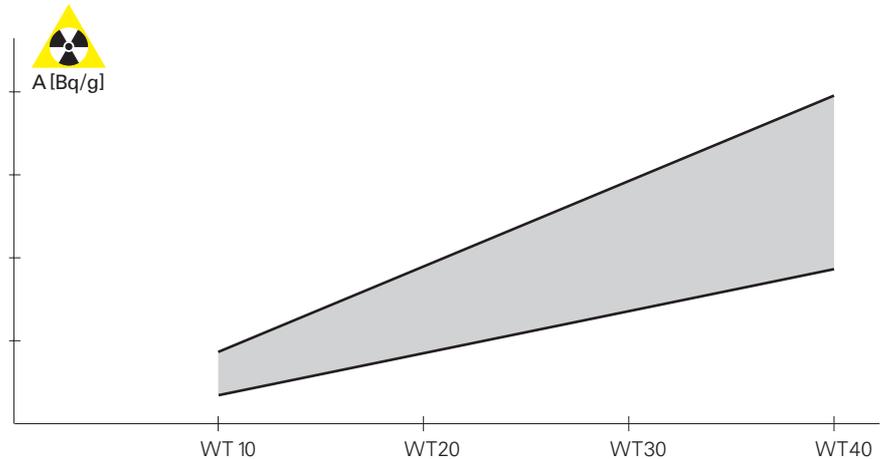
and requires appropriate precautions to be taken during its transportation, storage and handling. The possibility of thoriated tungsten electrodes being a health hazard and presenting a risk to the environment cannot be completely excluded.

## The radiation risk to TIG welders and others

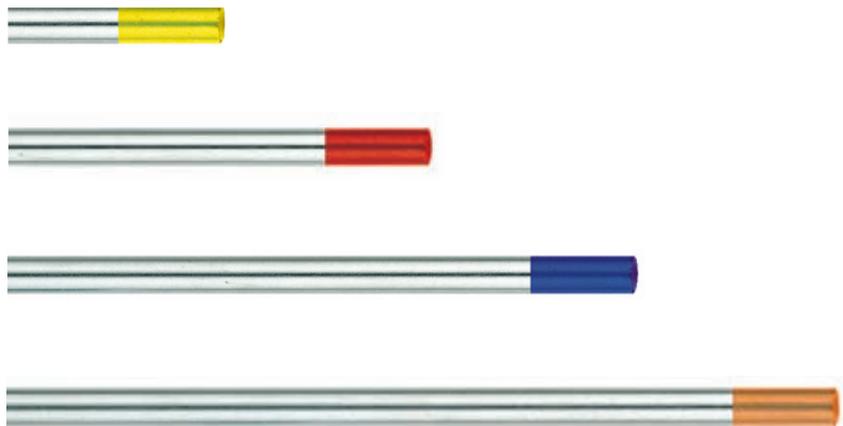
Studies have shown that, under average working conditions, TIG welders and others working with them can suffer radiation exposure of **15-20 mSv** (milli-Sieverts) **per annum**, the **lungs** being the **most severely affected organ** due to the inhalation of welding fumes and grinding dust in the absence of proper ventilation.

**The International Commission for Radiation Protection ICRP/60,91/ recommends a maximum exposure of 20 mSv per annum.**

Therefore, it is very important to provide effective extraction facilities for grinding dust and efficient ventilation of the workplace to remove welding fumes.



*The specific radiation activity  $A$  in Becquerels Bq/g of thoriated tungsten electrodes depends on the actual thorium content and fluctuates within wide limits according to the natural source of the thorium used and the time that has elapsed since it was mined.*



In Germany, the average exposure to **natural radiation**, i.e. from cosmic and terrestrial sources, from potassium-40 in the element potassium and from radon (a radioactive inert gas present in ordinary air, especially in poorly ventilated residential buildings) is **2.4 mSv per annum**.

**The effective total dose for an individual is the sum total of all separate cases of exposure to radiation.**

The extent to which the radiation dose absorbed through the handling of thoriated electrodes, i.e. including **WT20 „Red”** electrodes, is actually harmful to health is not fully understood.

Generally speaking, however, it is sensible to adhere to the „minimum” rule, namely:

**Exposure to radiation should always be kept as low as is technically and economically feasible.**

# WITSTAR® better than “Red” electrodes

WITSTAR® tungsten electrodes contain no radioactive materials and also possess better welding properties than WT20 “Red” electrodes.

WITSTAR® electrodes are not only friendly to your health and to the environment in general but also help welders to produce better quality work more often.

Although WOLFRAM INDUSTRIE is continuing to produce its normal range of thoriated tungsten electrodes, including the WT20 „Red“ of course, there is no doubt that WITSTAR® electrodes are the better alternative for all applications.

## The key factors for welders

The rare earths used in the manufacture of **WS2 WITSTAR®** electrodes and the lanthanum oxide in **WL20 WITSTAR®** electrodes ensure:

- reliable arc striking
- reduced burn-off rate
- prolonged service life
- high quality of arc

which provide an excellent foundation for total stability throughout the welding process.

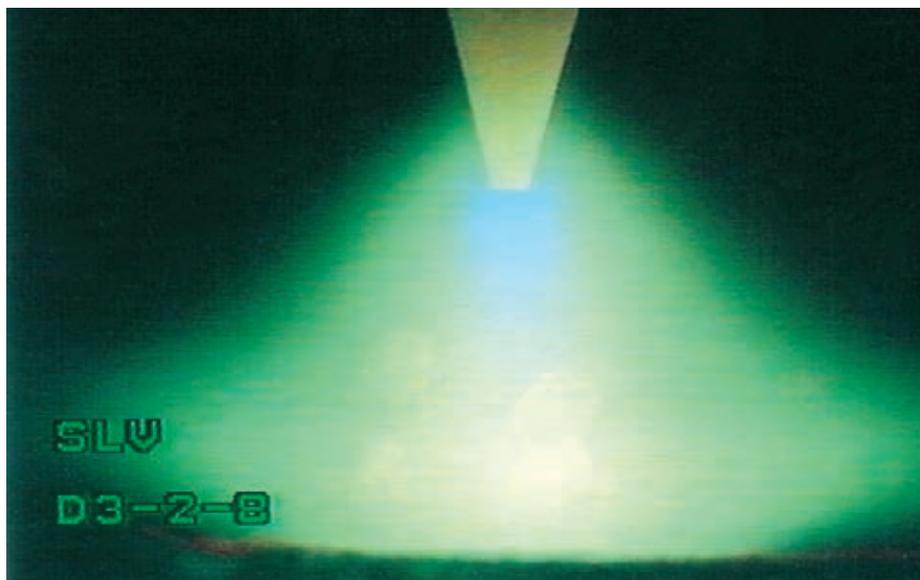
**Arc-striking and continuous-welding tests carried out by SLV of Munich<sup>1)</sup> have verified the excellent welding properties of WITSTAR® electrodes.**

## Arc-striking characteristics

In assessing arc-striking characteristics it is not only the **ignition properties of a new electrode** that are important but also the **re-ignition properties of an electrode** that has been in use for more than 30 minutes. The **reliability of ignition** was evaluated on the basis of the frequency of **misfire** (interruption of the arc with an ignition delay of  $\geq 250$  ms).

## Service life

The useful service life of welding electrodes can be shortened by insufficient **capacity for re-ignition, inadequate arc stability or changes in the tip geometry** after several strikes or extended periods of welding.



WS2 WITSTAR® after continuous welding for 1 hour with 3 interruptions every 15 minutes.

Arc-striking and continuous-welding properties	WT20	WS2 WITSTAR®	WL20 WITSTAR®
<b>Arc-striking</b>			
Ignition with new electrode	+	++	++
Re-ignition after $\geq 30$ minutes welding	o	++	++
Ignition without misfire	o	++	+
<b>Service life</b>			
Arc stability	+	+	+
Tip geometry evaluated according to „fringing“, burn-off, deposits, changes in grain structure, etc.			
after 60 strikes with 1 minute of welding each time	o	+	++
after 1 hour of continuous welding with 3 interruptions every 15 minutes	-	++	+

Extract from the results of arc-striking and continuous-welding tests conducted by SLV of Munich. The WT20 „Red“ electrode was used as a reference and often produced only „adequate“ (o) performance results, with the exception of excessive changes in grain structure and tip geometry after 1 hour of continuous welding (-). Arc stability was good with all 3 types of electrode (+).

<sup>1)</sup> Schweißtechnische Lehr- und Versuchsanstalt, Munich

# Product range

Code	Oxide additives WT %	Colour code	Standard
<b>WL 20</b> <b>WITSTAR®</b>	1,80 .. 2,20 La <sub>2</sub> O <sub>3</sub>	blue	
<b>WS 2</b> <b>WITSTAR®</b>	rare earths	turquoise	
<b>WP</b>		green	DIN/EN 26848
<b>WT 10</b>	0,90 .. 1,20 ThO <sub>2</sub>	yellow	
<b>WT 20</b>	1,80 .. 2,20 ThO <sub>2</sub>	red	
<b>WT 30</b>	2,80 .. 3,20 ThO <sub>2</sub>	purple	
<b>WT 40</b>	3,80 .. 4,20 ThO <sub>2</sub>	orange	
<b>WZ 8</b>	0,70 .. 0,90 ZrO <sub>2</sub>	white	
<b>WL 10</b>	0,90 .. 1,20 La <sub>2</sub> O <sub>3</sub>	black	
<b>WC 20</b>	1,80 .. 2,20 CeO <sub>2</sub>	grey	

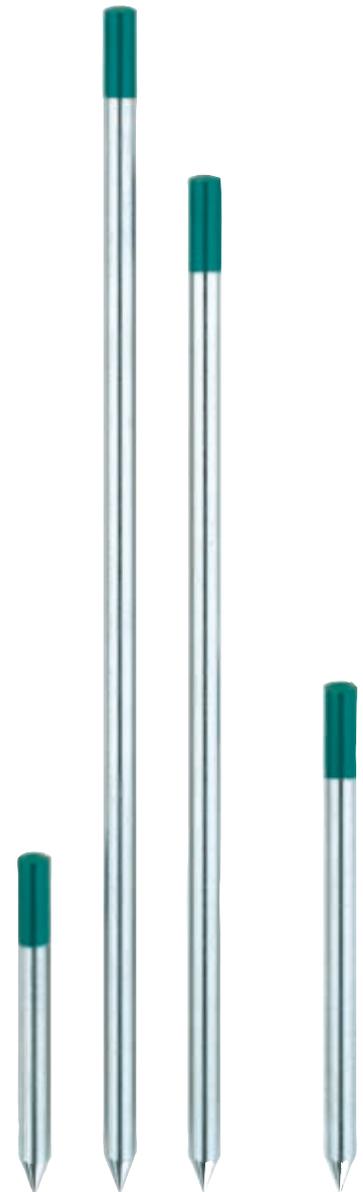
Other standards like ANSI/AWS A5. 12 on request.

Diameter in mm			Length in mm
0,5 ± 0,05	3,0 ± 0,1	6,0 ± 0,1	50
1,0 ± 0,05	3,2 ± 0,1	6,4 ± 0,1	75
1,6 ± 0,05	4,0 ± 0,1	8,0 ± 0,1	150
2,0 ± 0,05	4,8 ± 0,1	10,0 ± 0,1	175
2,4 ± 0,05	5,0 ± 0,1	12,0 ± 0,1	

Other diameters and lengths on request.



**Safety through progress**



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