



# TURTLE TOUGH<sup>®</sup>

## EXTREME LIQUID ANALYSIS

+pH & ORP   +Dissolved Oxygen   +Conductivity   +Turbidity



Sensors for the world's toughest conditions

[turtletoughsensors.com](http://turtletoughsensors.com)

Intelligently designed  
to perform in extreme applications.  
Turtle Tough's patented and  
advanced technology  
will change the way  
you experience liquid analysis.



# The world's toughest sensors

Our customers conduct liquid analytics in the toughest conditions in the world. They operate in mining, precious metal & ore refinement and extreme chemical processes, where most sensors are unable to provide accuracy or longevity.

## Turtle Tough sensors: Physically and chemically superior

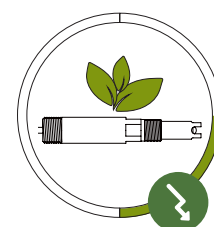
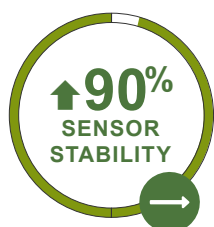
Turtle Tough sensors provide long life and high performance in the world's toughest environments. Through decades of experience hand-making sensors for the world's toughest applications, we have developed sensors that are optimised for:

- Mining/Slurry
- Extreme pH Levels
- High temperature
- High velocity and pressure
- Aggressive media
- Organic solvent
- High hydrofluoric acid
- Low maintenance

“ We are experts in building TOUGH sensors that improve process control, reduce sensor maintenance and outlast competitors in the toughest conditions. ”

Brenton Ward,  
Director

## Make a difference to your organisation when you choose Turtle Tough liquid analysis systems



### IMPROVE process control & optimise output

- Turtle Tough sensors are up to 90% more stable in extreme conditions
- Improved accuracy with less measurement drift
- Tighter process control optimises production output and reduces reagent consumption

### REDUCE sensor maintenance

- No gel or electrolyte liquid
- Totally sealed for life no maintenance required
- Reduced fouling
- Cleaning and calibration reduced by up to 50%
- No serviceable components

### OUTLAST competitors in extreme conditions

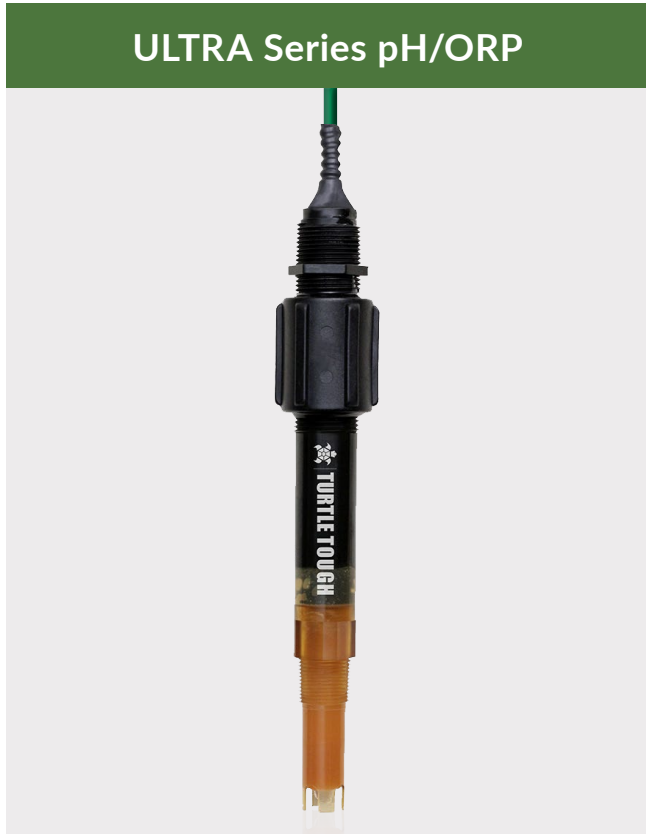
- Turtle Tough sensors last up to 10X longer than competitors under the same extreme conditions
- Longest life in the industry

### MINIMISE environmental impact

- Reduce reagent consumption
- Improve water treatment results
- Improve health and safety on-site
- Reduce wastage
- More efficient processing

# ULTRA Series - Digital Smart Sensors (DSS)

ULTRA Series sensors are made with the very toughest materials and the latest technology for exceptional performance in highly aggressive environments. ULTRA Series sensors have a wide variety of build options that allows us to optimise these sensors exactly for your application so you get a purpose-built sensor that will outperform all others.



ULTRA Series pH & ORP sensors are made with the very toughest materials and latest technology for exceptional performance in highly aggressive environments. Most importantly, they provide accurate and stable measurements under extreme conditions, where other sensors fail to provide a satisfactory service life. ULTRA Series sensors provide unmatched performance and through clever design and implementation methods allow them to be deployed in ways that greatly simplify sensor management. A large number of options allow them to be optimised specifically for your application.

ULTRA Series Dissolved Oxygen sensors have proven themselves in plants throughout the world to offer industry leading stability and measurement accuracy in harsh industrial applications. They are available in both Galvanic and Optical technologies availing them to a wide variety of applications. Made from tough thermoset plastics and unique sensing element technologies they can operate in environments where most sensors will fail. The Smart onboard technology and inbuilt diagnostic capabilities make calibration and sensor management for Dissolved Oxygen measurement easier than ever before.





The ULTRA Series sensors are arguably the most durable sensor that money can buy and represent our top of the line range. Our Digital Smart Sensors all have direct Modbus RTU output, so you have a range of flexible choices when it comes to connectivity. You can directly integrate with your PLC or data acquisition system, connect with our range of Smart Controllers and interface devices, or connect directly to a PC using our Windows sensor management software.

### ULTRA Series Conductivity

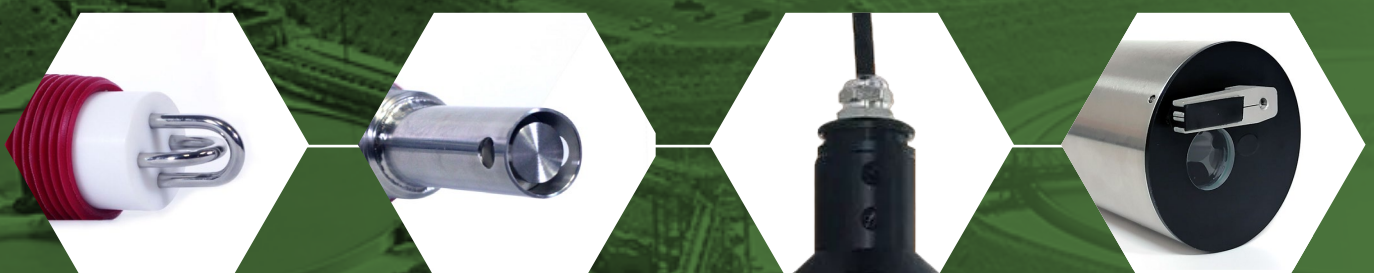


ULTRA Series Conductivity sensors offer outstanding performance in harsh applications. The Smart Sensor technology permits a wide and flexible range of measurement modes that are user selectable, accommodating a wide range of conductivities with little compromise to resolution. The sensor electrodes are available in Stainless Steel, Hastelloy and Titanium for compatibility with a wide range of media and providing phenomenal lifetimes. Open geometry designs reduce fouling and provide long periods of service between cleaning intervals.

### ULTRA Series Turbidity



The ULTRA Series Turbidity sensor with Auto Clean technology and dual IR beam is state-of-the-art when it comes to combining smart sensor technology with industry-leading optical measurement. Complete with an auto clean wiper blade, few sensors can boast the versatility, low maintenance and industrial strength that this sensor has to offer. The sensor body is made of 316L stainless steel and is available in titanium for environments with high levels of corrosion. The dual beam technology provides industry leading accuracy while the automatic wiper technology greatly improves measurement repeatability.





## Seriously different, next level Smart Technology

Turtle Tough's latest Digital Smart Sensor (DSS) technology has revolutionized the way we manage and communicate with sensors. Utilizing onboard microprocessors and memory, our Digital Smart Sensor technology has transformed how we connect, manage maintenance, monitor performance, and manage data compared to our analogue predecessors.

### Digital Smart Sensor Technology Benefits



#### Reduced Infrastructure Costs by Direct Integration

There is no longer a requirement for intermediary analyser hardware. Transmitters often cost thousands of dollars each and bear the inherent risk of obsolescence. Eliminating the need for an additional piece of hardware will reduce infrastructure costs, this is a huge incentive to directly integrate sensors for large scale installations.



#### Improved Maintenance Practices

Calibrate sensors anywhere, in the convenience of a laboratory or workshop. The days of performing calibrations connected to an analyser to store calibration information are over. No more cleaning and calibrating in-situ under adverse environmental conditions. Now you can take your sensors back to the workshop to clean and calibrate them efficiently in batches while you have fresh sensors installed on rotation. This maintenance regime is called hot swapping and it saves our customers more than 50% of the manpower involved with traditional sensor maintenance.



#### Improved Sensor Management

Obtain important information directly from the sensor such as last calibration date, time in service, sensor health and diagnostics. This key data will give you a clear understanding of the impact of the process upon the sensor and how your staff manage the maintenance. This knowledge will help you make informed decisions around operational changes to optimise your measurement practices.



#### Low Power Consumption & Long Transmission Capabilities

Digital Smart Sensors can operate from as little as 20mA\* current draw. This is an amazing benefit for remote applications that operate from the battery or solar power. Digital Smart Sensors can support cable distances of up to 1000m.

## What makes Digital Smart Sensors different?

- + **STORE CALIBRATION DATA**
- + **COMPUTE TEMPERATURE-COMPENSATED MEASUREMENT VALUES**
- + **PROVIDE DATA-RICH PARAMETERS**



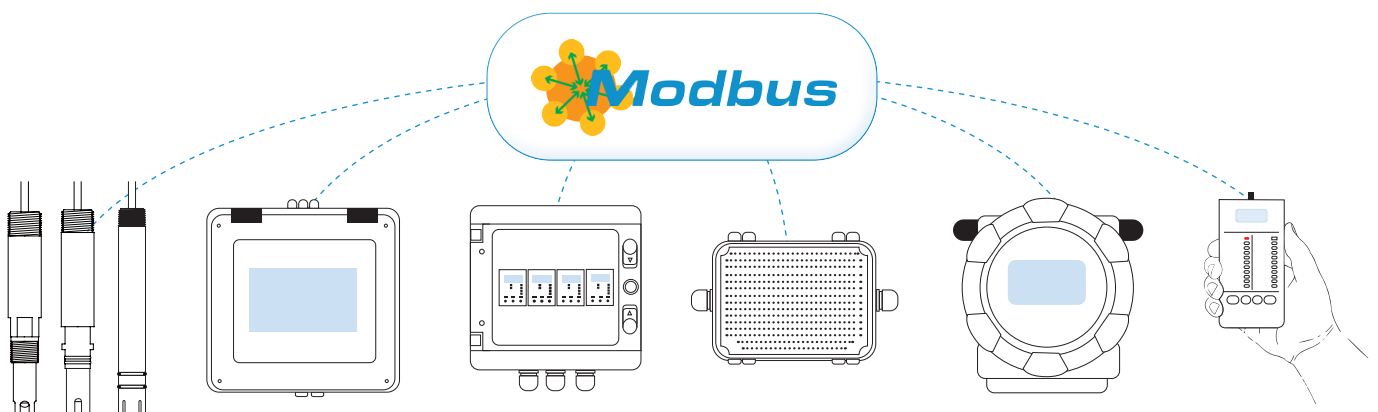
All Turtle Tough sensors with Digital Smart Sensor (DSS) Technology are equipped with an integral onboard microprocessor that computes temperature-compensated measurement values, stores calibration data and provides a stream of data-rich parameters. These unique features of the Digital Smart technology allow you to manage the health and performance of your sensors while maintaining an even closer eye on your process. Turtle Tough Digital Smart Sensors can perform all functions usually performed by an external analyser or transmitter due to the onboard microprocessor and memory chip on the sensor's body. They are designed to store calibration information directly to the sensor and output a fully calibrated digital signal. You'll no longer need traditional analyser hardware to perform this task.

Digital Smart Sensors can store historical information such as:

- Time in service
- Calibration intervals
- Service conditions
- The diagnostic information that records changes to the sensor

These essential data allows you to make critical improvements in the process measurement approach.

## We use Modbus Open-Source Communication Protocol



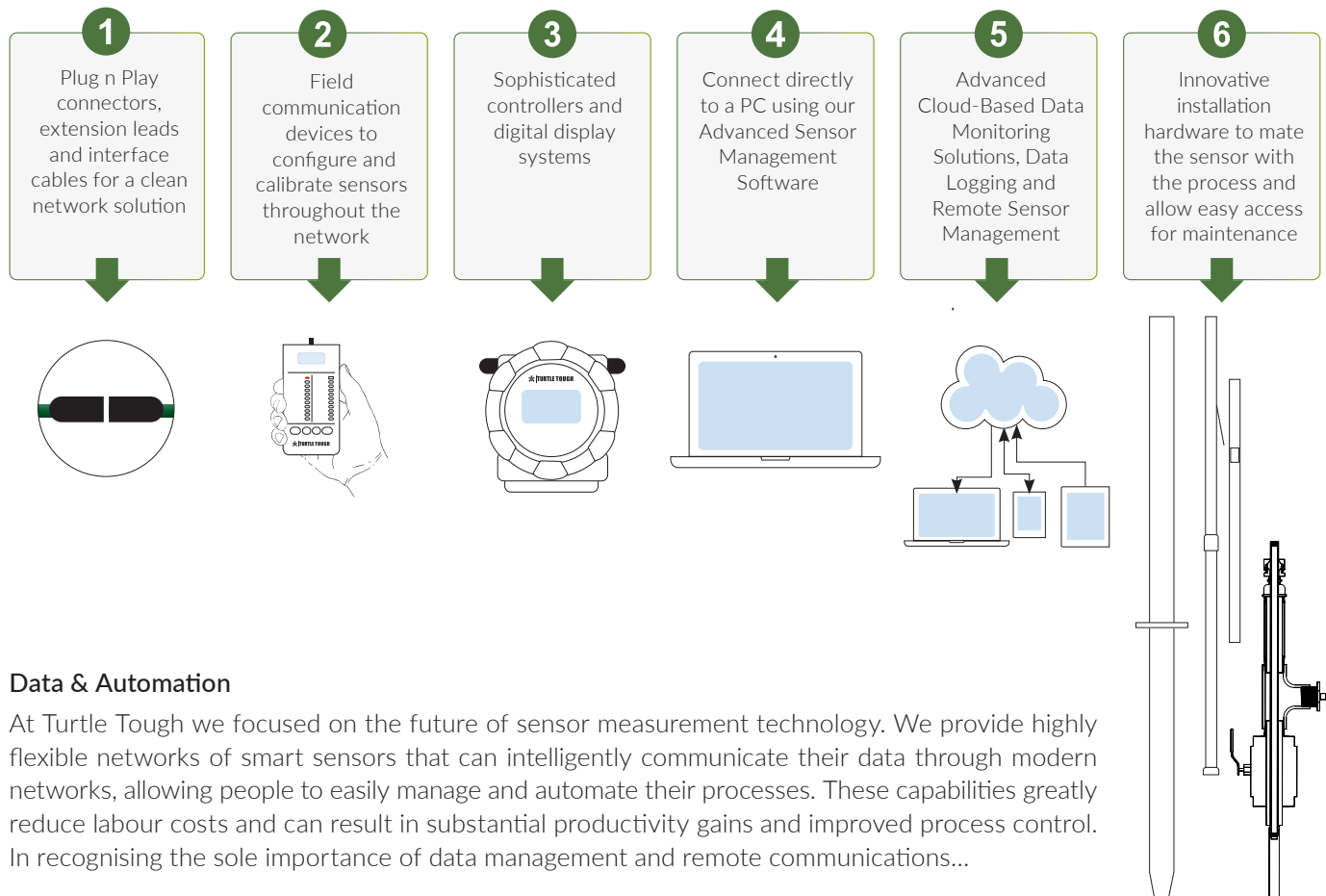
Turtle Tough's technology is broadly accessible. Our Digital Smart Sensor (DSS) technology is open source and our ULTRA Series Sensors provide a Modbus RTU output that can be integrated into virtually any PLC or compatible industrial network. This means no more "lock-in" vendor-specific hardware, allowing you to freely interface with any Modbus enabled device. Modbus has become a de facto standard communication protocol commonly available mean of connecting industrial electronic devices.

# Digital Smart Sensor Management Ecosystem



## Designed to integrate into your process

Turtle Tough provides a complete ecosystem of connectors, interfaces, controllers, communication and installation hardware to implement our Digital Smart Sensor (DSS) technology in the most convenient way possible. The result is an elegant system of networked sensors that provides the most advanced and flexible sensor management system on the market.



### Data & Automation

At Turtle Tough we focused on the future of sensor measurement technology. We provide highly flexible networks of smart sensors that can intelligently communicate their data through modern networks, allowing people to easily manage and automate their processes. These capabilities greatly reduce labour costs and can result in substantial productivity gains and improved process control. In recognising the sole importance of data management and remote communications...

**...we have developed comprehensive software and communication tools to make sensor and data management simpler than ever before.**





## Digital Smart Sensor Communication Hub & Management Software

Turtle Tough's Advanced Sensor Management software for Windows™ is the most comprehensive tool for real time readings, sensor configuration, calibration and advanced diagnostics. This incredible management tool can simultaneously connect to hundreds of sensors allowing users to manage all their sensors from a single PC connection.



## Controllers & Digital Display Systems

Extreme sensors call for extreme analysers and the Turtle Tough range of Digital Smart Analysers has been designed with exactly that in mind. Whatever the application, we have a wide range of communication and control options to interface with your Digital Smart Sensors.



## Field Communication Tools

Our range of handheld field communication and diagnostic tools provide convenient portable means of communicating with our sensors anywhere in the laboratory or field. This allows readings, configuration, calibration and diagnostics to be performed in convenient locations, especially when the sensor is offline or in the workshop for maintenance.



## Cloud Based Remote Monitoring

Via state-of-the-art data logging technology we are able to beam your data directly to our cloud based data hosting services via mobile (cellular) and satellite networks. A sophisticated online portal provides you access to all your sensor data where it can be viewed in real time, in an easy-to-read customisable dashboard. This provides you with a comprehensive view of your entire sensor network from virtually anywhere in the world.



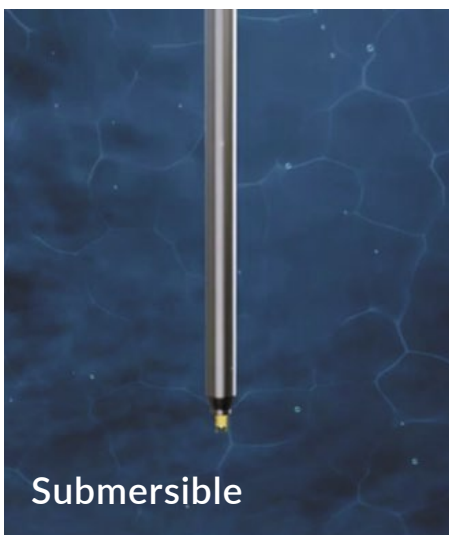
## Plug 'n' Play Connectivity

Turtle Tough's Digital Smart equipment is fitted with industrial quick connect fittings so you never have to hardwire again. Our multipin digital connector is NEMA6P rated and is supported by a range of connectivity options that include extension cables, interface connectors and multi sensor junction boxes so that you can build a sophisticated industrial network that is literally plug n play.



## Innovative, Clever Installation Hardware

The foundation of any reliable measurement solution is utilizing the correct installation and hardware techniques. Not only does this provide stable and predictable measurement outcomes, but it also facilitates ease of access, for maintenance and calibration. At Turtle Tough we pride ourselves on going that extra mile to make sure you have the complete solution. We have developed a wide range of installation hardware to ensure our pH and ORP sensors can perform at their best, while making your job easier.



**Submersible**

Our sensors with 'IMR' and 'SUB' configurations are designed for immersion and submersible installations. In Immersion use, the sensor is immersed into the process media, but the entire sensor is not submersed. In Submersible use, the sensor is completely immersed into the process media (from 30cm below the fluid level too much deeper).



**Inline**

For inline installations, Turtle Tough offers two types of sensor body configurations: 'INL' for Inline applications and Twist Lock inline (TWL) to allow for rapid insertion and removal of the sensor inline applications.

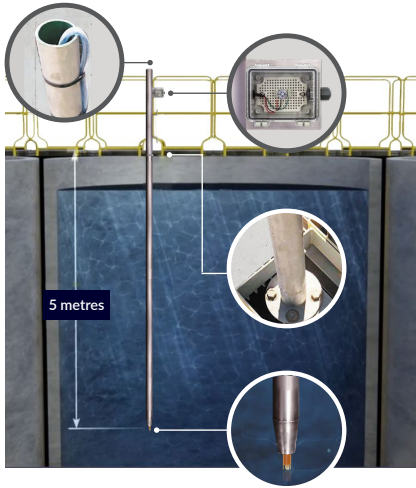


**Hot Tap**

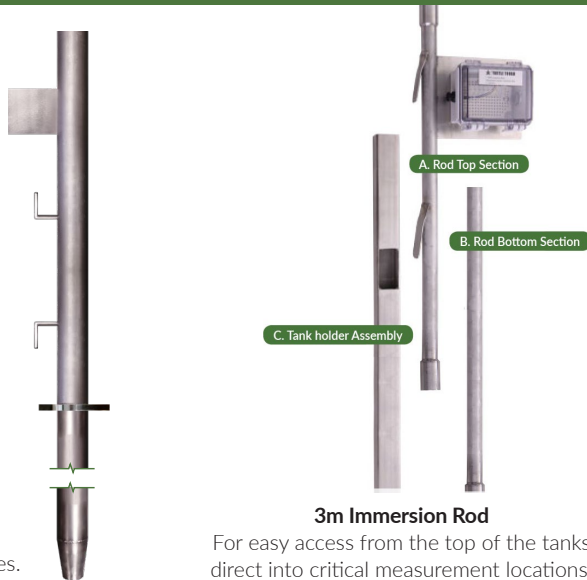
Sensors with 'INL' configuration are ideal for Turtle Tough's unique Hot Tap assembly. This installation method allows a fast and easy insertion and removal of sensors directly into process tanks or pipes at pressures up to 100 psig.

**IMMERSION & SUBMERSIBLE INSTALLATION - HARDWARE**

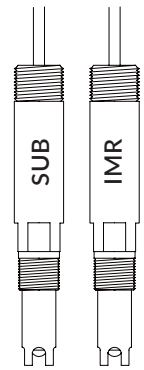
**MATING SENSOR**



**5m Drop Tube for in-tank submersion**  
For in-tank submersion depths greater than 3 metres.



**3m Immersion Rod**  
For easy access from the top of the tanks direct into critical measurement locations.



**Submersible or Immersion**

**INLINE INSTALLATION - HARDWARE**

**MATING SENSOR**



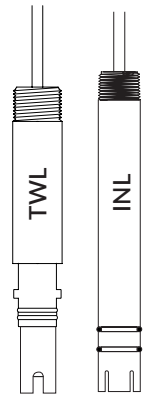
**Inline Sanitary**  
for accurate sensor insertion, easy calibration and cleaning in any process.



**Inline Twist Lock Bayonet**  
for rapid insertion and removal for inline applications.



**Inline Front-end**  
for high pressure or aggressive applications.



**Twist Lock or Inline**

**HOT TAP ASSEMBLY - HARDWARE**

**MATING SENSOR**



**Hot Tap Single or Dual Valve Retractable**  
for fast and easy insertion & removal of sensors directly into process tanks or pipes at pressures up to 100 psig.

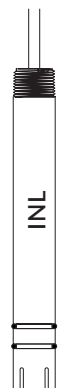
*The Hot Tap valve retractable assembly is designed for use in conjunction with the Inline Sensor Holder and Extension Tube assembly (sold separately).*



**Inline Sensor Holder**  
for applications involving high impact on the sensor.



**Sensor Insertion Rod**  
for applications involving low impact on the sensor.



**Inline**



# TURTLE TOUGH

## Sensor Measurement Systems

pH and ORP  
Dissolved Oxygen  
Conductivity  
Turbidity  
Ammonium  
Cyanide  
Calcium  
Chlorine  
Fluoride



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