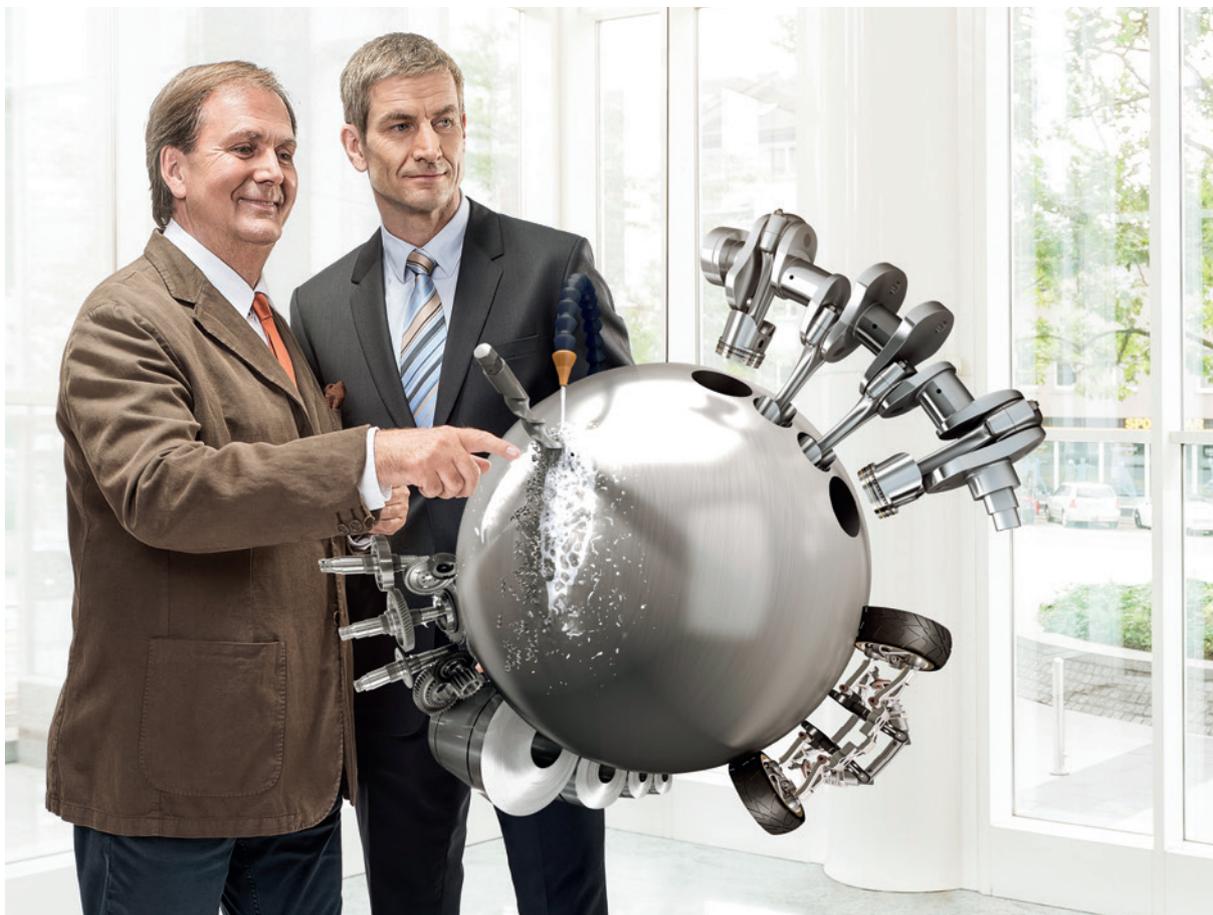


# Corrosion Inhibitors for Metalworking Fluids



# REWOCOROS®

## METAL PROTECTION THROUGH CORROSION INHIBITION

### MULTIFUNCTIONAL CORROSION INHIBITORS FOR AQUEOUS METALWORKING FLUIDS

Corrosion inhibitors are an integral part of metalworking fluid formulations and are widely used in water miscible metalworking fluids. Their main purpose is to prevent rust formation and corrosion on work pieces, machine parts and tools made of metals.

Additionally, depending on the composition and chemical structure of individual components, our corrosion inhibitors may also provide co-emulsification, low foaming tendency, and enhanced lubricity which make them multifunctional. Applications include soluble oils, semi synthetic and full synthetic fluids as well as cleaners.

Corrosion inhibitors marketed by Evonik under the trade name REWOCOROS® exhibit excellent corrosion inhibition properties for steel, iron, aluminum, and other metals. Typically REWOCOROS® products are offered as compounds based on fatty acid amides, alkanol-amides, boric acid or imidazolines.



## MULTIFUNCTIONAL CORROSION INHIBITORS FOR FERROUS METALS

Products such as REWOCOROS® AC 101 and REWOCOROS® AC 100 US are designed to provide excellent corrosion inhibition in metal working formulations. Ideally corrosion inhibitors show a low foam tendency and enhanced lubricity, properties which are present in these products. When used as a co-emulsifier (with fatty alcohol ethoxylates) they can transform milky emulsions into transparent micro emulsions with good stability.

## MULTIFUNCTIONAL CORROSION INHIBITORS FOR NON-FERROUS METALS

REWOCOROS® AL 200 and offers out-standing corrosion inhibition of aluminum alloys and other non-ferrous metals. Additionally REWOCOROS® AL 200 provides excellent EP/AW\*-properties and reserve alkalinity to water based systems. The performance of REWOCOROS® as in aqueous metalworking fluids can be evaluated by applying different test methods.

\*EP = Extreme Pressure, AW = Anti-Wear



Filter chip test

## FILTER CHIP TEST

Standard test methods as the chip/filter paper method acc. to DIN 51360 (part 2) are used to determine corrosion prevention characteristics of aqueous metal working fluids. Cast iron chips caused no staining (filter paper on the right)

after being treated for 2 hours with REWOCOROS® containing water based cooling lubricant. In comparison, the iron chips caused staining (filter paper on the left) without REWOCOROS® products.



Without corrosion inhibitor



With REWOCOROS®

## BIMETALLIC CORROSION COUPON TEST

The bimetallic corrosion coupon test (ASTM F 483-98) is designed to evaluate corrosion inhibition of additives in aqueous metalworking formulations. Metal plates are immersed in an electrolyte for 14 days and mass loss and visual inspection are taken as indicators of performance.

## IMPEDANCE SPECTROSCOPY

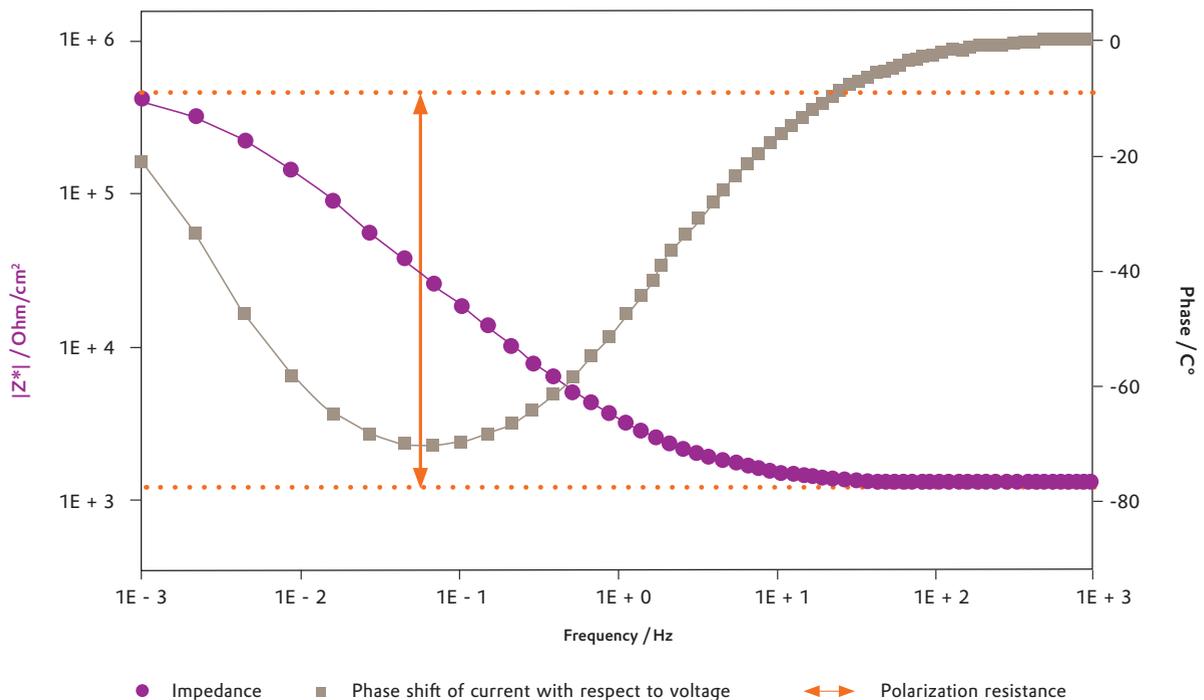
Electrochemical methods can be used for the characterization of corrosion inhibitors: Current-potential measurements and impedance spectroscopy provide a deeper insight into the mechanism of corrosion inhibition and the interactions between corrosion inhibitors and metal surfaces.

Furthermore, useful information can be collected on the mode and rate of corrosion of the metal surface and most importantly how corrosion inhibitors can inhibit it. The diagram shows an impedance spectrum. The electrical resistance across the metal-water interface is dependant on the adsorption of corrosion inhibitor molecules. The resistance, commonly known as polarization resistance, is a direct measure for the inhibitor performance, and should be as large as possible.



Electrochemical impedance spectroscopy equipment

### IMPEDANCE SPECTRUM





## Corrosion inhibitors

TRADE NAME	APPLICATION				CHEMICAL BASE	ADDITIONAL BENEFITS
	FERROUS METALS	ALUMINUM	EMULSIFI-ABLE FLUIDS	WATER SOLUBLE FLUIDS		
REWOCOROS® AC 101 <sup>1)</sup>	●		●		Modified fatty acid monoethanolamide	Co-emulsifier, lubricity enhancer
REWOCOROS® AC 100 US <sup>2)</sup>	●		●		Modified fatty acid monoethanolamide	Co-emulsifier, lubricity enhancer
REWOCOROS® AC 28	●		●		Modified fatty acid diethanolamide	Co-emulsifier, lubricity enhancer
REWOCOROS® AL 200	●	●	●	●	Ethoxylated fatty alcohol phosphoric acid ester	EP-/ AW-properties, lubricity enhancer
REWOCOROS® AC 261	●	●	●	●	Fatty acid diglycolamide, modified	Co-emulsifier, lubricity enhancer
REWOCOROS® RA BE	●	●	●	●	Boric acid and diethanol amine (DEA)	Low foaming tendency, improves buffer capacity

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