

# Crosslinker KHFN0304

## 1. Introduction

Crosslinker are generally introduced to polymer-based fracturing to improve the rheological properties of fracturing fluids.

KHFN0304 is a borate crosslinker used in N<sub>2</sub> foamed guar based fracturing fluids such as E-Frac. Borate-cross-linked N<sub>2</sub> foamed guar-based fracturing fluids reach optimum properties when the pH is in the range of 10.5-12.0. Crosslinker KHFN0304 itself contains a pH buffer and delaying agent to optimize crosslinking and improve fluid viscosity and stability.

## 2. Physical Properties and Hazards

Additives	Form	S.G.	Water Solubility	Health Hazard	Physical Hazard	pH
KHFN0304	Light yellow liquid	1.18-1.23	Soluble	Eyes, skin, Inhalation	Corrosive	12.0-14.0 (1%)

## 3. Chemical Properties and Application

KHFN0304 is a borate crosslinker used in N<sub>2</sub> foamed guar-based fracturing fluids. It provides the required pH value to crosslink guar or derivatives hydrated in salt or mix-water. Therefore, it is used in most guar or guar derivative-based fracturing fluids to improve fluid rheological properties and temperature stability. The pH value is controlled within the range of 10.5-12.0 under most application conditions.

KHFN0304 molecules contain special groups that delay the crosslink reaction between borate and guar or guar derivative molecules. Depending on the chemical environment such as mix-water, reactant concentrations such as KHFN021, and temperature, crosslink delay time can be controlled in the range of 1-6 minutes.

The optimum KHFN0304 concentration should be designed based on the required crosslink delay time and fluid properties, depending on other additives and their concentrations.

KHFN0304 is compatible with all additives used in E-Frac fracturing fluid systems, which are engineered for use up to 200°F.

## 4. Treatment

The concentration of KHFN0304 dependent on the polymer concentration, temperature, mix-water salinity and desired crosslink delay time. Typically, 3-10 Gal/1,000 Gal KHFN0304 are required to cover most applications.

## 5. Packaging

KHFN0304 is supplied in 55 gallons high density polyethylene (HDPE) drums or 265 gallons HDPE totes. Keep it away from extreme conditions such as places near flames or direct sunlight.