Product Sheet
HEAT TRANSFER FLUIDS

PROTECTOGEN ®
C AQUA

CORROSION INHIBITOR FOR CLOSED HEATING AND COOLING SYSTEMS WITHOUT FROST PROTECTION

CLARIANT INTERNATIONAL LTD
BU INDUSTRIAL & CONSUMER SPECIALTIES
TECHNICAL APPLICATIONS EMEA IA

Rothausstrasse 61
4132 Muttenz
Switzerland

CONTACT
Technical: + 49 (0) 8679 7 4665
commercial: + 41 (0) 61 469 7834

ISSUE
May 2014

Product description

Protectogen® C aqua is a yellowish, water soluble, glycol free liquid which contains a highly efficient combination of corrosion inhibitors.

The product is inhibited without the use of nitrite, amine, borate, phosphate and silicate.

The optimization of the corrosion inhibition system was performed without the use of CMR-substances (Cancerogenic Mutagenic Reprotoxic).

According to the formulation Protectogen® C aqua does not contain any restricted substances as described in the EG-guideline 2011/65/EU (RoHS = Restriction of Hazardous Substances), article 4 §1 like lead, mercury, cadmium, chromate VI, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE).

You can find more information about our products on our homepage www.antifrogen.com.

Declaration of REACH-conformity

Clariant declares that all of its products marketed in the EU, i.e. substances, preparations or articles within meaning the article 3, section 1-3 of regulation (EC) 1907/2006 of the European Parliament and the council of 18.12.2006 (REACH), hereinafter referred to as "substances" are delivered in accordance with all applicable chemical laws, with special references to the REACH-regulation (EC).

Protectogen® C aqua

Recommended usage concentration: 1.5 % v/v in water
Recommended permanent usage temperature: approx. +5 to +95 °C

Physical values
Protectogen® C aqua

Value	Unit	Result
Density at +20 °C (DIN 51757)	g/cm³	approx. 1.070
Refractive index at +20 °C (DIN 51423, Teil 2)	-	approx. 1.385
pH-value undiluted (DIN 51369)	-	approx. 8.5
Reserve alkalinity pH 5.5 (ASTM D 1121)	ml 0.1 M HCl/ml	min. 80
Boiling point at 1013 mbar (ASTM D 1120)	°C	approx. 102
Pour point	°C	approx. -10
Kinematic viscosity at +20°C (ASTM D 51562)	mm²/s	approx. 9.8
Dynamic viscosity at +20 °C	mPa·s	approx. 10.5
Surface tension at +20 °C (ASTM D 1331)	mN/m	27.5
Specific electrical conductivity at +25 °C (DIN EN 27888 ISO 7888:1985)	mS/cm	56.0

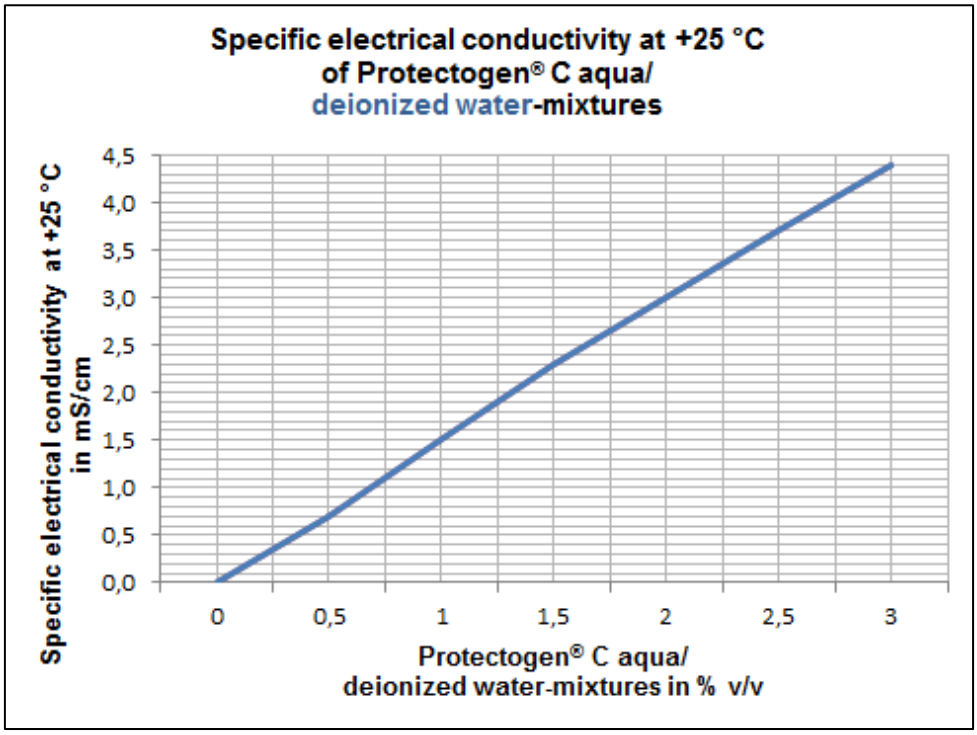
Physical values
Protectogen® C aqua 1.5 % v/v in deionized water

Value	Unit	Result
Density at +20 °C (DIN 51757)	g/cm³	approx. 1.00
Refractive index at +20 °C (DIN 51423, Teil 2)	-	approx. 1.334
pH-value undiluted (DIN 51369)	-	approx. 7.5-8.5
Kinematic viscosity at +20°C (ASTM D 51562)	mm²/s	approx. 1.2
Dynamic viscosity at +20 °C	mPa·s	approx. 1.2
Surface tension at +20 °C (ASTM D 1331)	mN/m	39.1
Specific electrical conductivity at +25 °C (DIN EN 27888 ISO 7888:1985)	mS/cm	2.3

To check the concentration of Protectogen® C aqua in the final mixture the specific electrical conductivity should be used.

Specific electrical conductivity at +25 °C of Protectogen® C aqua/ deionized water-mixtures

Mixture	Unit	Result
Protectogen® C aqua 0.5 % v/v in deionized water	mS/cm	0.7
Protectogen® C aqua 1 % v/v in deionized water	mS/cm	1.5
Protectogen® C aqua 1.5 % v/v in deionized water	mS/cm	2.3
Protectogen® C aqua 2 % v/v in deionized water	mS/cm	3.0
Protectogen® C aqua 2.5 % v/v in deionized water	mS/cm	3.7
Protectogen® C aqua 3 % v/v in deionized water	mS/cm	4.4



In case that no deionized or distilled but tap- or drinking water will be inhibited with Protectogen® C aqua, the final concentration can be determined as follows:

1. Determine the specific electrical conductivity at +25 °C of the used water.
2. Determine the specific electrical conductivity at +25 °C of the Protectogen® C aqua/water-mixture.
3. Subtract the conductivity of the water in use (point 1) from the conductivity of the mixture (point 2) and use the graphic above to determine the concentration of Protectogen® C aqua.

The accuracy of the method is within the range of ±10 %.

Product properties

The certified quality system in accordance with DIN EN ISO 9001 is used in production and quality control. This ensures consistently high product quality.

The technical data below are used to describe the product and is taken from our own measurements or from literature. It does not constitute part of the delivery specification. The actual product specification may be obtained upon request.

Application properties

Protectogen® C aqua is delivered undiluted and should always be diluted with water.

The concentration of Protectogen® C aqua in water should be 1.5 % v/v. That means that 1.5 l Protectogen® C aqua will be added into 98.5 l water. The water used to dilute Protectogen® C aqua shall contain no more than 100 mg/kg (ppm) chloride. This should be borne in mind particularly if systems contain components made of aluminium or aluminium alloys. A wide range of water hardness is acceptable (between 0 and 20° GH). This means that in addition to fully deionized water ordinary tap water may be used.

Protectogen® C aqua is especially suitable for the use in cold water sets which do not require frost protection, i.e. in a temperature range from approx. +5 to +95 °C.
This mixture does not offer any frost resistance and it is therefore not suitable for outdoor applications in winter. For protection from frost please use our products Antifrogen® N, L, SOL HT or KF.

By adding Protectogen® C aqua the specific heat transfer abilities of water will not be influenced significantly at all.

Protectogen® C aqua can be added in closed heating systems if there is any possibility of oxygen access through seals or plastic elements which can no be avoided.

Material compatibilities

Protectogen® C aqua contains corrosion inhibitors which permanently protect the metals of the cooling- and heating systems even in combined systems permanently against corrosion.

The effectiveness of the inhibitor combinations is checked constantly by the manufacturer by means of the corrosion test method: ASTM D 1384 (**A**merican **S**ociety for **T**esting and **M**aterials).

The following table shows the low weight changes of common metals caused by a Protectogen® C aqua/water-mixture compared with pure water.

The values determined by the above mentioned method (ASTM D 1384) show the weight losses/increases of the metals in g/m²:

metal	water [a]	Protectogen® C aqua [b] 336 hours	Protectogen® C aqua [c] 336 hours	Protectogen® C aqua [c] 1000 hours	limits
copper	-2.1	-0.7	-1.0	-0.7	±10
soft solder	-79.2	-0.7	-5.2	-2.3	±30
brass	-7.5	-1.0	-1.6	-1.0	±10
steel	-162.7	-0.3	-0.3	-0.4	±10
gray iron	-218.7	-0.1	-0.2	-3.2	±10
AlSi6Cu3	-32.8	-3.2	-2.7	-0.8	±30

[a] water without inhibitors

[b] Protectogen® C aqua 1.5 % v/v with deionized water

[c] Protectogen® C aqua 1.5 % v/v in ASTM-water

Water without inhibitors should not be used due to its corrosive properties.

Seals which are commonly used in heating systems (elastomers) have been found to be compatible.

Service and monitoring

It has been found that Protectogen® C aqua/water-mixtures can be used in installations for many years.

The performance of the Protectogen® C aqua/water-mixture should be checked at intervals of two years.
If a 250 ml sample is provided the distributors can perform this service. For major industrial installations these tests can be performed directly by Clariant Produkte (Deutschland) GmbH, BU ICS, TA EMEA IA, Werk Gendorf, Industrieparkstraße 1, 84508 Burgkirchen, Germany, phone +49 8679 7 2272 (www.antifrogen.com, please see "Technical informations").
The data in our service report relate solely to the sample sent to us. Guidance on further use of the product tested assumes that the system is in proper condition and properly operated. We expressly point out that, particularly where corrosion or scale is already present in the system, interactions with the product may occur with unpredictable consequences. We accept no liability whatever for any damage resulting from the improper condition or operation of the system.

Safety and handling

Value	Unit	Result
Flash point (DIN ISO 2592, Cleveland, open cup)	°C	>100
Ignition temperature (DIN 51794)	°C	495
Temperature class (DIN/VDE 0165)	-	T1

Protectogen® C aqua/water-mixtures have neither a flash point nor a fire point.

In dealing with Protectogen® C aqua the necessary precaution and industrial hygenist protective measures and the informations in the safety data sheet should be considered.

Protectogen® C aqua is harmful to humans and animals if swallowed.

The water hazard class of pure Protectogen® C aqua is WGK 1, the ready-made Protectogen® C aqua/water-mixture (usually 1.5 % v/v Protectogen® C aqua in water) is rated as being not water-polluting.
The results of the ecotoxic study shows the good biodegradability and toxicological harmlessness of Protectogen® C aqua. The product is readily biodegradable.

Undiluted Protectogen® C aqua has to be disposed in accordance with local regulations.

Further information will be found in the current safety data sheet.

Transport and storage

VbF	-
GGVE/RID	non-regulated
GGVS/ADR	non-regulated
ADNR	non-regulated
IMDG-Code	non-regulated
UN-Nummer	-
IATA-DGR	non-regulated

Protectogen® C aqua is supplied by our Antifrogen®-distributors in non-returnable corrugated drums (220 kg) and diverse small containers. Further informations about our Antifrogen®-distributors you can find on our homepage www.antifrogen.com.

Undiluted Protectogen® C aqua has a storage stability of two years if stored in closed original packaging.

Informations to our further products

Antifrogen® N
Antifrogen® N is a liquid, tinted pale yellow, for use as a heat transfer medium in closed hot water heating systems, heat pumps and as cooling brine in industrial refrigeration equipment. Antifrogen® N is not suitable for the use in food or pharmaceutical applications.

Antifrogen® L
Antifrogen® L is a blue tinted, clear liquid, which is used as a heat transfer medium in heat recovery systems and in the food and pharmaceutical sector or where the possibility of the heat transfer medium entering process water or hot water cannot be excluded. For this applications a certificate "humantoxicological valuation" is available (www.antifrogen.com, see "Downloads")
Antifrogen® L contains as the base product the toxicologically harmless 1,2-propylene glycol, which is approved by the FDA (Food and Drug Administration acc. § 184.1666 of the Federal Register from 1.4.1985). Propylene glycol is registered as a generally harmless food additive in the USA. Also, Antifrogen® L is approved as an officially fire extinguishing agent (VdS-certificate, www.antifrogen.com, see "Downloads").

Antifrogen® KF
Antifrogen® KF is a non-toxic clear liquid, based on an aqueous formiate solution which is used as a low-temperature brine down to -50 °C in industrial and food refrigeration systems. The brine has a low viscosity at low temperatures.

Antifrogen® SOL HT
Antifrogen® SOL HT is a physiologically harmless, yellowish, clear liquid based on an aqueous solution higher boiling glycols which is used as a heat transfer medium in solar heating, especially those exposed to high thermal loads. The product is premixed with deionized water to give a frost resistance of about -23 °C.

Antifrogen® SOL Clean
Antifrogen® SOL Clean is a physiologically harmless, colorless, clear liquid based on glycol ethers with characteristic odor. Antifrogen® SOL Clean is used as a cleaning agent in solar systems.

Antifrogen® Homepage

Please visit us at www.antifrogen.com where you can find newest informations of our product range. Additionally the technical leaflets can be downloaded there.