COVENANT

KIWA Covenant
K96600-02

Issued: 1 May 2018

STATEMENT BY KIWA

This Covenant of Kiwa ascertains that the:

SaniTube®W and SewaTube®
trenchless rehabilitation systems for drinking water and sewerage networks under pressure
diameters 80mm up to 400 mm

as manufactured and installed by

Amex Sanivar AG

are tested for the transport of drinking water and domestic sewage under pressure.

The requirements and validation methods, including the prescribed inspections and marking of the products are embodied in this Kiwa Covenant.

Luc Leroy
Kiwa



Publication of the Covenant is allowed only as complete version.
This Covenant consists of 16 pages.
Advice: consult www.kiwa.nl in order to ensure that this Covenant is still valid.

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PREFACE

This Covenant has been prepared by the Technical Committee “Amex – Kiwa inserted hose systems” of Kiwa Nederland B.V. and accepted by the KKC Evaluation Group. This KCC Evaluation Group also supervises the certification activities and where necessary requires the Covenant to be revised. All references to the Technical Committee and KKC Evaluation Group in this evaluation guideline pertain to the above mentioned Technical Committee and KKC Evaluation Group.

This Covenant will be used by Kiwa in conjunction with the Kiwa Manual for Covenants 2016. This manual details the methods employed by Kiwa for conducting the necessary investigations prior to issuing the Covenant and the method of external control.

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1 Scope of the KIWA COVENANT

1.1 Intended use of the SaniTube®W and SewaTube® trenchless rehabilitation system

The trenchless rehabilitation systems SaniTube®W is particularly designed for the rehabilitation of pipelines for the transport of pressurized potable water.
The trenchless rehabilitation system SewaTube® is particularly designed for the rehabilitation of pipelines for the transport of pressurized domestic sewage.
The rehabilitation systems applied for the rehabilitation of pipes ranging from DN 80 to DN 400.
Bends up to 45 degrees can be accommodated.
The inserted hose systems are intended for the transport of cold potable water and domestic sewage with a maximum temperature of 35 ºC.
The inserted hose systems rely on the existing pipeline for radial support in order to resist without failure throughout its design life. It does not rely on adhesion to the host pipe.

1.2 Definition of the SaniTube®W and SewaTube® trenchless rehabilitation system

The SaniTube®W and SewaTube® trenchless rehabilitation system consist of the following components:
1) A circular woven hose made of polyester yarn;
2) Polyethylene (PE) coating on the inside and the outside of the hose;
3) Stainless steel flange couplings.

1.3 Assumed working life of the SaniTube®W and SewaTube® trenchless rehabilitation system

The provisions and the verification and assessment methods included or referred to in this Kiwa Covenant have been written based upon the assumed working life of the SaniTube®W and SewaTube® trenchless rehabilitation systems for the intended use of 50 years when installed in the works. These provisions are based upon the current state of the art and the available knowledge and experience.

"Assumed working life" means that, when an assessment following the Kiwa Covenant provisions is made, and when this working life has elapsed, the real working life may be, in normal use conditions, considerably longer without major degradation affecting the requirements.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee given by the product manufacturer or his representative or Kiwa Nederland B.V. issuing the Kiwa Covenant, but are regarded only as a means for choosing the appropriate products in relation to the expected economically reasonable working life of the works.

1.4 Procedure in the case of a significant deviation from the Kiwa Covenant

In cases in which the in works installed SaniTube®W and SewaTube® trenchless rehabilitation system does not comply to the requirements of the Kiwa Covenant, the complaint and appeal procedure according to the Kiwa Regulations for Product Certification are applicable.

2 Terminology, definitions and symbols

2.1 Meaning of “fitness for use”

"Fitness for (the intended) use" of the piping system means that the products have such characteristics that the installed SaniTube®W and SewaTube® trenchless rehabilitation systems, if properly designed and built, can:

- satisfy the requirements of this Kiwa Covenant and
- be fit for their intended use and in this connection satisfy the requirements of this Kiwa Covenant, if normally maintained.

2.2 Assessment of fitness for use

The relevant characteristics of the SaniTube®W and SewaTube® trenchless rehabilitation systems for its fitness for use (requirements) and the required verification methods to be employed are given in chapters 3, 4, 5 and 6 as well as the actual performed assessment of fitness for use and proven conformance to the relevant characteristics of the liner system and its components.

2.3 Terminology

Supplier (Amex Sanivar AG)
The party that is responsible for ensuring that the products and processes meet and continue to meet the requirements on which the certification is based.

IQC schedule
A description of the quality inspections carried out by the supplier as part of his quality system.

Product and process requirements
Requirements made specific by means of measures or figures, focusing on (identifiable) characteristics of products and processes and containing a limiting value to be achieved, which limiting value can be calculated or measured in an unequivocal manner.

Pre-certification tests (type tests)
Tests in order to ascertain that all the requirements recorded in the Covenant are met.

Inspection tests
Tests carried out after the certificate has been granted in order to ascertain whether the certified products continue to meet the requirements recorded in the Covenant, thereby also indicates the frequency with which inspections are carried out by Kiwa.

Note:
The test matrix summarized which tests will be carried out by Kiwa for the Pre-certification and the inspections, and the frequency with which the inspections will be carried out.

2.4 Abbreviations

The in this Covenant used abbreviations have toe following meanings.

Abbreviation	Meaning
DN	Nominal diameter
IQC	Internal quality control

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3 RELEVANT CHARACTERISTICS OF THE LINER TUBE, THE REQUIRED VERIFICATION METHODS AND THE ASSESSMENT OF FITNESS FOR USE

3.1 Influence of water intended for human consumption

3.1.1 Requirement and method of verification

Kiwa hygienic aspects (HA) approval

The parts which come into contact with drinking water are not allowed to release substances in such quantities which can jeopardise the health of the consumer or the quality of the drinking water. For that, the mentioned products have to meet the toxicological, microbiological and organoleptical requirements which are laid down in the valid Dutch "Ministerial Regulation materials and chemicals drinking water- and warm tap water supply" (published in the government Gazette).
The procedure for obtaining a recognised Kiwa HA quality declaration, as meant in the valid Regulation, has to be concluded with positive results for the products concerned.

3.1.2 Assessment

After toxicological evaluation and hygienic testing, the products do fulfill the requirements for Kiwa HA, see Kiwa test report nr. PB2017002138 dated 26 July 2017.

3.2 Hose system, construction and specifications

3.2.1 Requirement and method of verification

The nominal diameters as indicated in table 1 are applicable.

Table 1: nominal diameter of the finished product (hose)

DN (mm)	80	100	150	200	250	300	400

The specifications of the hoses and flange adapters are laid down in data specification sheets and these sheets must be authenticated by Kiwa.

3.2.2 Assessment

The data specification sheets of the hoses are authenticated by Kiwa during the initial audit at Eschbach on 12 April 2017. The technical drawings including material specifications are authenticated by Kiwa during the initial audit at Amex on 20 April 2017.
The requirements of 3.2.1 are fulfilled.

3.3 Raw materials

3.3.1 Requirements and methods of verification

The incoming batches of raw materials shall be provided by the supplier of the raw materials with test certificates 3.1B according EN 10204, for the following characteristics and limits:

Polyethylene

- MFR 190°C/2,16kg according ISO 1133: values between 2,5 and 3,5 g/10 min;
- Density according ISO 1183-1/method A: values between 900 and 904 kg/m^3.

Polyester yarn (for woven hose)

- Linear density according BISFA, chapter 6: values between 1085 and 1165 dtex;
- Breaking strength according BISFA, chapter 7: values between 76,5 and 87,7 N;
- Tenacity according BISFA, chapter 7: values between 68,0 and 78,0 cN/tex;

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- Elongation at break according BISFA, chapter 7: values between 20,5 and 25,5 %;
- Elongation at specific force (45N) according BISFA, chapter 7: values between 11,0 and 15,0 %;
- Hot air shrinkage (180°C, 2 min) according ASTM D4974: values between 1,2 and 2,0 %.

The entry control by Amex for the flange adapters shall include the following aspects:
- Damage of coating and flanges, dimensions and completeness of delivery.

3.3.2 Assessment

During the initial audit at Eschbach on 12 April 2017, several test certificates 3.1B according EN 10204 from latest deliveries of the polyethylene raw material and polyester yarns have been checked and approved. The types of raw materials involved are laid down in an annex to the certification agreement (part of hygienic approval).
During the initial audit at Amex on 20 April 2017, the incoming goods procedure (number A.2) for the flange adapters and the registrations of corresponding inspections performed have been checked and approved.
The requirements of 3.3.1 are fulfilled.

3.4 Short term characteristics finished product (hose)

3.4.1 Requirements

The requirements according table 2 are applicable.

Table 2: short term mechanical requirements imposed on the finished product

DN host pipe (mm)	Outside diameter hose (mm)	Wall thickness (mm)	Weight +/- 5% (kg/m)	Tensile strength longitudinal (N/cm)	Tensile strength circumferential (N/cm)	Elongation at break longitudinal (%)	Elongation at break circumferential (%)
80	72 ± 2	2,6 – 3,0	550	> 1.000	> 800	> 20	> 40
100	92 ± 3	2,5 – 2,9	710	> 1.000	> 800	> 20	> 40
150	136 ± 3	2,7 – 2,9	1.200	> 1.000	> 800	> 20	> 40
200	189 ± 3	3,5 – 4,0	2.400	> 1.000	> 800	> 20	> 40
250	228 ± 4	4,0 – 4,2	3.000	> 1.000	> 800	> 20	> 40
300	271 ± 5	4,0 – 4,5	2.500	> 1.000	> 800	> 20	> 40
400	356 ± 5	4,0 – 4,5	2.770	> 1.000	> 800	> 20	> 40

3.4.2 Method of verification

A witness test at Eschbach has been carried out whereby the requirements of table 2 are verified.
Hereby the following test methods are applicable:
- Weight per unit area (g/m) according EN-ISO 4671
- Dimensions according EN-ISO 4671;
- Tensile strength and elongation at break according EN-ISO 13934-1 with tensile velocity of 100 mm/s.

3.4.3 Assessment

A witness test has been carried out by Kiwa at Eschbach on 12 April 2017. The test results are included in completed Eschbach test report dated 30 June 2017.

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3.5 Long term characteristics finished product (hose)

3.5.1 Requirements and method of verification

The finished product shall fulfill the following long term requirements

- Resistance to abrasion according DIN EN 295-3;
- Oxygen induction time (OIT) according EN 728 at 200°C > 20 min;
- Resistance to chemical attack by domestic sewage according DIN 1986-3 and EN ISO 175.

3.5.2 Assessment

Determination of oxygen induction time of the finished product: according to test report from Hochschule Hamm-Lippstadt, dated 30 June 2017, the measured OIT is 30 min.
Resistance to abrasion: test report from IKT with nr P06297, dated 9 June 2016.
Resistance to chemical attack: test report from Siebert + Knipschild with nr 18-210-01899-PB-2.
The requirements of 3.5.1 are fulfilled.

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4 RELEVANT CHARACTERISTICS OF THE FITTINGS, THE REQUIRED VERIFICATION METHODS AND THE ASSESSMENT OF FITNESS FOR USE

4.1 Flanges

4.1.1 General

The flange adapters are incoming goods. Therefor requirements to the entry control by Amex of these products are applicable.

4.1.2 Entry control regarding build-up, dimensions, damages

4.1.2.1 Requirement and verification

There shall be an implemented procedure for incoming goods with respect to the flange adapters covering the aspects build-up, dimensions and damages.
To be verified by Kiwa during initial audit.

4.1.2.2 Assessment

During the initial audit at Amex on 20 April 2017, the incoming goods procedure (number A.2) for the flange adapters and the registrations of corresponding inspections performed have been checked and approved.
The requirements of 4.1.2.1 are fulfilled.

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5 RELEVANT CHARACTERISTICS OF THE JOINTS, THE REQUIRED VERIFICATION METHODS AND THE ASSESSMENT OF FITNESS FOR USE

5.1 Leak tightness of the joints

5.1.1 Requirement and method of verification

The combination of hose and flange adapter (joint) shall be leaktight, to be tested as follows: 1.000h internal hydrostatic pressure test, with a pressure of 10 bar at a temperature of (20 ± 5)°C.
The test shall be witnessed by Kiwa at Amex.

5.1.2 Assessment

A witness test has been carried out by Kiwa at Amex on 20 April 2017 (present at the beginning of the test). The test results are reported by Amex to Kiwa via the registration of maintained pressure of minimum 10 bar during the test duration of 1.000h.
The requirement of 5.1.1. is fulfilled.

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6 FACTORY PRODUCTION CONTROL (FPC)

For ensuring the appropriate quality during production of the liner and liner system concerned, Eschbach and Amex have implemented a factory production control (FPC) under the umbrella of a quality management system according to EN ISO 9001.

The FPC is laid down in a Schedule of Internal Quality Control as agreed upon between Eschbach, Amex and Kiwa. This is confidential information not to be disclosed in the Covenant.

The major characteristics covered by the Schedule of Internal Quality Control are:

- Entry control raw materials and components;
- Batch release tests;
- Process verification tests;
- Control of non-conforming product;
- Inspection with regard to packaging, storage and transportation;
- Calibration of measuring equipment;
- Handling of complaints.

Registrations of the FPC performed are made and kept for a minimum of 10 years. These registrations indicate the type of assessments and tests, the amount of tests and samples, the test results as well as date of production and testing.

Procedures for maintenance of the production machines, entry-control raw materials, production, FPC and testing, calibration of measuring instruments, storage, non-conforming products and customer complaints are available.

Production of the liner takes place at Eschbach.
Amex is responsible for the liner system and takes care of:

- Sales;
- Transport and packaging;
- Entry control Eschbach products and flanges;
- Handling of customer complaints;
- Installation instructions.

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7 INITIAL INSPECTION AND CONTINUOUS SURVEILLANCE BY KIWA

Within the scope of pre-certification tests, Kiwa has ascertained at Eschbach and Amex works whether the manufactured products and the installation of the products meet the quality requirements and technical specifications as laid down in this Covenant. Hereby:

- samples were taken in the producer's works by and on the instructions of Kiwa and were tested by Kiwa (for hygienic aspects);
- it was assessed whether the production processes used by Eschbach and Amex offers sufficient confidence that the manufactured products are of a constant quality;
- whether Eschbach and Amex have a FPC and IPC in place which ensures that any nonconformities are spotted in time and that, if necessary, corrective actions are taken;
- whether Eschbach and Amex has implemented adequate procedures in respect of the following aspects:
    - maintenance of the production machines and equipment, entry-control raw materials, production, FPC, IPC and testing, calibration of measuring instruments, storage, non-conforming products and customer complaints.

The following works (production locations) were ascertained:

- Eschbach in Marsberg (Germany);
- Amex in Neuendorf (Switzerland).

Within the framework of this Covenant agreement Kiwa carries out inspections at regular intervals of one time per year to the production locations as mentioned below, to ensure that Amex complies with her obligations:

- Eschbach in Marsberg (Germany);
- Amex in Neuendorf (Switzerland).

The inspections are carried out by Kiwa employees and include:

- inspections to ascertain whether the product specification laid down in the Covenant is being complied with;
- inspections of the production and installation process;
- inspections of the FPC and IPC (IQC scheme) in use and the results of the tests recorded by Amex;
- inspections to ascertain whether the products are marked correctly;
- inspections to ascertain whether Amex is complying with the procedures for dealing with complaints and taking corrective actions.

The characteristics of the hose system that are subject to external quality control by Kiwa including possible testing in the Kiwa laboratories are specified in table 3.

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Table 3 – Requirements for external quality control

Characteristics	Article of the Covenant	External quality control	Frequency
Influence of water intended for human consumption	3.1	Yes	1x per year at Eschbach[1)]
Hose system, construction and specifications	3.2	Yes	1x per year at Eschbach[2)]
Raw materials	3.3	Yes	1x per year at Eschbach[3)]
Short term characteristics finished product	3.4	Yes	1x per year at Eschbach[4)]
Long term characteristics finished product	3.5	Yes	1x per year at Eschbach[5)]
Flanges	4.1	Yes	1x per year at Amex[6)]
Leak tightness of the joints	5.1	Yes	1x per year at Amex[7)]
Factory production control	6	Yes	1x per year at Eschbach and Amex[8)]
Surveillance	7	Yes	1x per year at Eschbach and Amex
Marking of the products	8	Yes	1x per year at Eschbach and Amex
Packaging, storage, transport	9.2	Yes	1x per year at Amex
Use, maintenance, repair	9.3	Yes	1x per year at Amex
Installation instructions	9.4	Yes	1x per year at Amex

1) Sampling and hygienic testing of hose
2) Check of validity of technical data specification sheets and compliance of the finished products with the declared technical specifications
3) Assessment of test certificates of the supplied raw materials
4) Witness test during inspection
5) Determination of OIT at Hochschule Hamm-Lippstadt
6) Assessment of incoming goods procedure
7) Witness test to be performed at Amex
8) Assessment of Schedule of Internal Quality Control

8 MARKING OF THE PRODUCTS

Each hose shall be marked - on the product itself and its packaging - with the following marks:

- Kiwa word mark and the water mark (see below);
- Kiwa Covenant number;
- Name of the producer or system name;
- Production date or coding;
- Hose type designation.

The other individual components of the hose system will not be marked with the KIWA certification mark.

Amex may use the KIWA certification mark (see below) in combination with the certificate number for example in: quotations, brochures, website, etc.

Kiwa Certification Mark

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9 ASSUMPTIONS UNDER WHICH THE FITNESS FOR THE INTENDED USE IS ASSESSED

9.1 Manufacture of the product

The end-manufacturing of the hose system parts take place at the following production locations:
Fabrication of the hose:
Jakob Eschbach AG
Unterm Ohmberg 7
34431 Marsberg

Fabrication of flanges
Rudolf Fomm GmbH
Niederlassung Bochum
Ückendorfer Str. 58-62
44866 Bochum

9.2 Packaging, transport, storage of the products

According Amex QM- Manual Chapter 8: Produkt- und Dienstleistungsrealisierung and the internal quality scheme as approved by Kiwa.

9.3 Use, maintenance, repair

According Amex SaniTube®W method statement (check latest version on website www.sanivar.ch).

9.4 Installation instructions

According Amex SaniTube®W method statement including installation manual (check latest version on website www.sanivar.ch).

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10 Titels of standards

Number	Title	Version*
EN-ISO 175	Plastics - Methods of test for the determination of the effects of immersion in liquid chemicals	2010
EN-ISO 4671	Rubber and plastics hoses and hose assemblies - Methods of measurement of the dimensions of hoses and the lengths of hose assemblies	2008
ASTM D4974-04	Standard Test Method for Hot Air Thermal Shrinkage of Yarn and Cord Using a Thermal Shrinkage Oven	2016
BISFA, chapters 6 and 7	BISFA Test methods for polyamide filament yarns	2004
DIN-EN 295-3	Steinzeugrohrsysteme für Abwasserleitungen und Kanäle – Teil 3: Prüfverfahren	2012
DIN 1986-3	Drainage systems on private ground - Part 3: Specifications for service and maintenance	2004
EN 728	Plastics piping and ducting systems - Polyolefin pipes and fittings - Determination of oxidation induction time	1997
ISO 1133	Plastics - Determination of melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics	2005
ISO 1183-1	Plastics - Methods for determining the density of non-cellular plastics	2012
EN-ISO 13934-1	Textiles - Tensile properties of fabrics - Part 1: Determination of maximum force and elongation at maximum force using the strip method	2013