HYGIENIC TUBE & PROCESS COMPONENTS

Pre-INSULATED TUBE SYSTEMS

SKS
We know your process flow

Solutions based on solid arguments

100% Watertight

The outer jacket and connection between joints are 100% watertight and proleet the carrier tube against corrosion. The system is theretore completely cleanable, even when you clean the outside with high pressure jets. S.K.S. is equipped to engineer an absolutely condense free solution.

Minimal energy loss

Because the pipe supports are attached around the outer jacket, there is no cold bridge. This ensures long service lite and the continuous high insulation value saves a lot of energy. Because there is no connection between tube and pipe support, you will have the ultimate protection against corrosion.

Resistance against corrosion

The quality of the outer jacket protects the carrier tube trom the outside environment. There are many alternatives tor protecting the pipeline trom the corrosive influence of salt, chemicals etc.

Stable and robust

The physical condition of the pre-insulated tubes is very robust. You can hardly damage it. When these tubes are installed correctly according the guidelines, you can even use it as a walkway.

Minimal maintenance costs

The robust system maintains its insulation value *tor* its complete litetime. Under normal conditions il is watertight and hard to damage. Besides the minimal energy casts, this pre-insulated solution guarantees you minimal maintenance casts.

Quick and easy installation

All the design and engineering is done before the installation.
When the welding and pressure test is done, you only have to connect the insulation with the joints. Our experienced installers are trained and have certificates.
The installation time is much shorter than tor traditionally insulated tubes and this guarantees a quicker return on investment.

Custom made

The pre-insulated tube system is an engineered product with many options. S.K.S. has developed itself into a specialist. Our skills, the opportunities provided by the system and our relationship with certified installers all mean that our pre-insulated solution can fully meet your requirements.

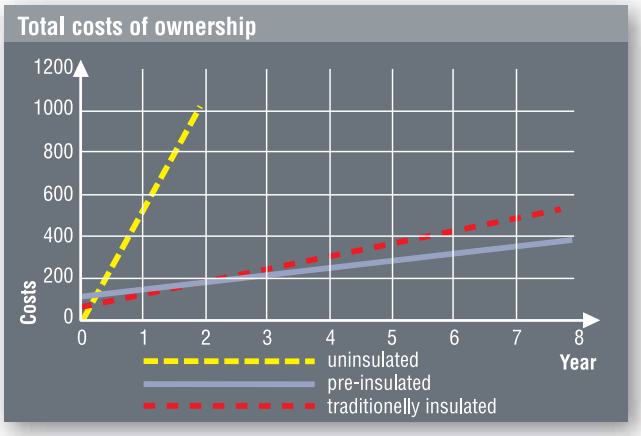
Arguments translated to your effort

These are solid arguments. The *Pre*-insulated Tube System offers you many alternatives and advantages. Here we explain what our *Pre*-insulated Tube System can mean for you depending on your place in the supply chain.

End user of the tube system

The system **saves money**

- Quicker return on investment
- Minimal maintenance
- Long service life
- Lower energy costs
- One partner for the tube system and insulation



Contractor

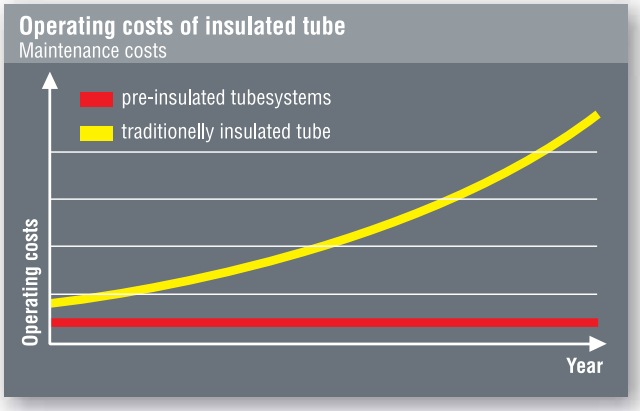
Working with the system **gives** you an **advantage**

- Cover a wider range of your customer's needs (integration)
- Register as a certified installer
- Greater influence on the project
- Tube system is upgraded to an engineered product
- S.K.S. is your partner in the field

Engineering company

More **added value** in a project

- The system is always custom made
- Pro-active solution for your customers problems
- S.K.S. is an objective partner with a range of solutions
- Calculating program available
- List of certified installers available
- The system offers technical and financial advantages



Turnkey companies

One contact for the complete tube system

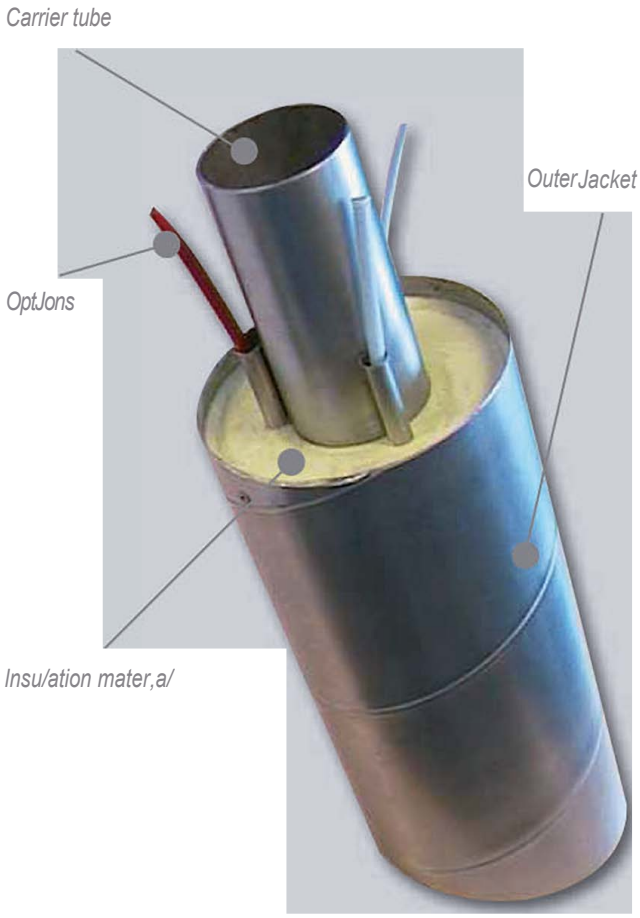
- All engineering and planning up front
- Clear calculation opportunity
- Logistics and technical project management combined
- S.K.S. offers you an optimal back-office support

With the solid arguments and our detailed explanation, we hope that you have reached the same conclusion as we have - *pre*-insulated Tube Systems are complete solutions for the entire market. Because:

Why insulate afterwards, when you can do it much better up front?

The pre-insulated system

The pre-insulated tube system is the ultimate solution for pipe bridges because of its economical and technical advantages. But you can also use the system in places where cleanliness, high resistance to corrosion or fire proofing are necessary. The combination of all these alternatives or even in combination with traditional insulation can give you the best solution for your requirements.



The *pre*-insulated system is a mixture of knowledge and 4 adjustable components.

Carrier tube:

S.K.S. can deliver tubes in all kinds of materials as pre-insulated tube. We have specialised knowledge about the tubing systems required tor the process industry. We have extensive experience in supplying tubes and we are one of the biggest stockholders in Europe for stainless steel tube.

Insulation material:

The insulation material used depends on the application and can be divided into three categories. There is an ultra flexible PUR (-200°C / +60°C), a standard PUR (-60°C / +140°C) and a combination of PUR and mineral waal (-5°C / 315°C)

Outer jacket:

Every environment has its own specific demands for the outer jacket. The S.K.S. range covers most possible requirements. You can choose between HOPE (black or white), Aluminium, Stainless steel (304 or 316) and Alu-zinc.

Options:

In the field we have noticed several applications with special requirements. These vary trom trost protection, space saving or just a visual aspect. To meet these demands the pre-insulated tube systems are supplied with many options such as tracing, alarm cable, jacket in jacket, dual tube, a polished jacket etc.

The standard ranges

The *Pre*-Insulated Tube Systems are designed as complete systems for specific applications and as such, can only be used within those areas. The different systems are divided into several series, which are based on the application, environment and the different outer jackets alternatives.

LT - Low temperature

- Operating temperature -200 / +140º C
- Bonded system
- Freely suspended systems only

NT - Normal temperature

- Operating temperature -60 / -10º C freely suspended system
- Operating temperature -10º / +140º C freely suspended and directly burried system
- Bonded system only

HT2 - High temperature

- Operating temperature +140º C / +315º C
- Bonded system
- Freely suspended systems only

HT3 - High temperature

- Operating temperature +140º C / +315º C
- Sliding system
- Directly burried systems only

Burried system

Freely suspended

Systems

Bonded system

In a bonded system, the carrier tube, insulation and outer jacket are bonded together by adhesion, which allows them to expand and move as a single entity.

The outer surface of the carrier tube and the inner surface of the jacket pipe are pre-treated, so that the foam adheres to the tubes and that stresses can be transmitted through the insulation.

The tube system moves as a single entity. Movements can be restricted by pipe supports or other means of friction against the jacket. Freely suspended tube systems must be able to move freely. Changes in temperature in directly buried systems can be absorbed as stresses in the system. A sandwich construction consisting of mineral wool and PUR foam is applied in the temperature range trom + 140° C to + 315° C.

Used as a directly buried system (HT3), the pre-insulated high temperature system operates as a sliding system (see sliding system), and when used as a freely suspended system, it operates as a bonded system (HT2).

Flexible system

S.K.S. offers flexible tube systems tor temperatures ranging trom -200° C up to + 120° C. A characteristic feature of the flexible systems is the carrier tube, which is manufactured in a flexible material.

In genera!, expansion does not have to be taken into consideration when it comes to flexible systems.

In the flexible systems, the stresses are absorbed trom temperature effects in the carrier tube. Minor tube dimensions are delivered in coils. The tube can be bent on site tor the desired layout of the pipeline.

Sliding system

In a sliding system, the carrier tube moves inside the insulation which is adhered to the jacket. The jacket must therefore be fixed to its outside environment, e.g. by soil friction in the case of directly burried pipe systems. The expansion is absorbed in special components within the jacket of the system. Consequently, the carrier pipe must be fixed with anchors (compensators and expansion bends).

Insulation series

The thickness of the insulation is standardised in three categories and is used to meet all technical or economical demands.
The categories can be used as alternatives for each other. The choice for a thicker insulation can be advantageous in the long term as it guarantees the reduction of the energy costs.

Tube and jacket dimensions

Carrier tube diameter			Outside diameter HDPE jacket:			Outside diameter metal jacket:		
Ø in mm.	Ø in inches.	DN	Serie 1	Serie 2	Serie 3	Serie 1	Serie 2	Serie 3
19 mm - 35 mm	1/2" - 1"	25	90	110	125	80	112	125
40 mm - 53 mm	1 1/4" - 1 1/2"	40	110	125	140	112	125	140
60 mm - 76 mm	2"	50	125	140	160	125	140	160
76 mm - 89 mm	3"	65	160	180	200	140	168	180
89 mm - 104 mm		100	180	200	225	168	180	212
108 mm - 133 mm	4"	100	200	225	250	180	200	268
139 mm - 159 mm	5"	125	225	250	280	212	225	268
159 mm - 168 mm	6"	150	250	280	315	250	268	315
168 mm - 193		175	280	315	355	250	268	315
193 mm - 219 mm	8"	200	315	355	400	315	355	400
219 mm - 273 mm	10"	250	400	450	500	400	450	500
273 mm - 323 mm	12"	300	450	500	560	450	500	560
323 mm - 356 mm	14"	350	500	560	630	450	500	560
356 mm - 406 mm	16"	400	230	630	710	500	560	630
406 mm - 457 mm	18"	450	630	710	800	560	630	710
457 mm - 559 mm	22"	500	710	800	900	630	710	800
559 mm - 660 mm	26"	600	800	900	1000	710	800	900
660 mm - 762 mm	30"	750	900	1000	1100	900		
762 mm - 813 mm	32"	800	1000	1100	1200	900		
813 mm - 914 mm	36"	900	1100	1200				
914 mm - 1016 mm	40"	1000	1200	1400				
1016 mm - 1220 mm	48"	1200	1400					

The pre-insulated applications

Insulation of tube systems is very common in industry, but you find it also in other applications. Pre-insulated tubes have their roots, *tor* example, in the district heating sector and have been used since the 1960s. The application for pre-insulated tubes is much bigger then we once expected because of the water tightness and the extremely low permeability.
Since we introduced Pre-insulated tubes in our programme, we have entered also non-industrial sectors, *tor* example: ice skating halls, air systems in shopping malls and airports and cooling systems on board ships.
S.K.S. has the facilities and experience to communicate and deliver worldwide.

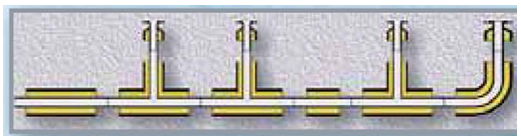
In all cases S.K.S. has engineered or advised its certified contractors concerning the pre-insulated system chosen. During the engineering phase we deal with all requirements and technica! specifications. The system has also its limitations and therefore every pre-insulated tube system will be delivered custom made.

Custom made:

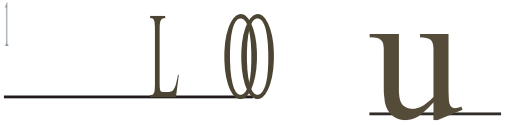
We can fully meet your requirements with the flexible options of the pre-insulated tube system. We have an answer to most of your technica! issues.
Depending on the installation time, the experience of the contractor and most of all the size of the selected tube, there are 3 installation possibilities.

- Tube pre-insulated and all connections (straight, bend and tees) will be installed afterwards.

- Tubes, bends and tees are all pre-insulated.
  You only have straight connections.



- Complete tube system is pre-insulated. System has a flange on bath ends, so that you easily can replace a section.



These alternatives have all the same end effect!

Process carrier tube

Every application requires a different kind of process tube. Normally the choice of this process tube is based on experience or depends to the application chosen by an engineer. Process tubes are selected according to the medium to be transported.The material used for production of these tubes can vary and depends on the application. To prevent energy loss and corrosion and for personal protection, the tubes will be insulated.

In all cases up to NW800, where traditional insulation is still used, S.K.S. PTS can provide you with the pre-insulated solution.

In combination with the possibilities offered by our sister company S.K.S. Process Components, we can even provide you with all necessary tubes, fittings and flow components from all leading manufacturers.
With the experience and specialisation of the S.K.S. companies we can manufacture all kinds of process tubes and tube fittings. We can advise you in your material choice or be a partner in making a final specification.

The *Pre*-insulated Tube Systems will be delivered with the most legible process tube which meets all legal and technical demands. S.K.S. will ensure the tube meets the specifications according to;

- Pressure Equipment Directive 97/23/EC (PED)
- European Hygienic Equipment Design Group (EHEDG)

The main issue in these directives is **traceability**.
Pre-insulation is a permanent solution and therefore all marks on the tube will be erased. We are allowed to remark the tube and we can therefore guarantee traceability in several ways.

The tubes are delivered in standard lengths of 6 metres, but we can also deliver tubes in lengths of 12 metres and 18 metres or in other fixed lengths. We have the following choice of material for the process tube:

- Steel: Welded tube st. 37.0 acc. EN 10217-2 or EN 10217-5
  Seamless tube st. 35.8 acc. EN 10216 or st. 33.2
- Stainless steel: Industrial welded tube acc. EN 10217-7 (DIN 17457)
  Dairy tube acc. DIN 11850, BS4825-1 or ISO 2037
  Pharma tube acc. ASME BPE or DIN 11866
  Seamless tube acc. DIN 17458
- Plastic: PEX, HDPE, PVDF or PVC
- Others: Copper F37, GRP etc.

Media/carrier tube	Coolants	Glycol	Ammonia	Ice water	Liquid food	Steam	Conden-sate	Domestic water	Brine	Oil	Waste oil
Steel tube	X			X	X		X	X			X
Stainless steel tube											
Plastic tube	X		X	X	X	X	X				
Copper tube	X	X	X	X	X	X	X		X	X	X

Recommended media/carrier tube X = not used for this application = possible for this application = most used for this application

St. 37.0 BW

High-frequency welded St. 37.0 BW to P235 GH
According to EN 10217-2 or EN10217-5 (DIN 1626).
Measurements and weights to DIN 2458.
Bevelled ends to DIN 1626/4.10.5.
Testing pressure min. 50 bar or eddy-current tested.
Welding zone 100% NDT- tested to SEP 1917.
Mill certificate to EN 10204/3.1 B.
Supplied in lengths of 6, 12 and 16 m.

Application
Heat and steam (T<210ºC)

Mechanical properties of **St. 37.0 BW:**
Density 7850 kg/m^3
Tensile strength >360 N/mm^2
Yield stress >235 N/mm^2
Young's modulus 2.1·10^5 N/mm^2
Thermal properties:
Coefficient of expansion 1.2·10^{-5} ºC^{-1}
Specific heat 0.48 kJ/kgºC
Thermal conductivity 76 W/mºC

St. 35.8 I

Seamless steel tube St. 35.8 I to P235 GH TC1
According to EN 10216 equivalent to St. 35.8 I (DIN 17175)
Measures and weight according to DIN 2448.
Mill certificate to EN 10204/3.1 B.
Ends, in dimensions from 3.2 mm wall thickness, are bevelled according to DIN 2559/2.2 or 2.1.
Ends <3.2 mm thickness are bevelled according to DIN 2559/1.
Supplied in lengths of 6 and 12 m.

Application
Heat, steam and condensate.

Mechanical properties of **St. 35.8 I:**
Density 7850 kg/m^3
Tensile strength >360 N/mm^2
Yield stress >235 N/mm^2
Young's modulus 2.1·10^5 N/mm^2
Thermal properties:
Coefficient of expansion 1.2·10^{-5} ºC^{-1}
Specific heat 0.48 kJ/kgºC
Thermal conductivity 76 W/mºC

AISI 304L (wst. 1.4301, 1.4306 or 1.4307)

Welded tube AISI 304L according to EN 10217-7 (DIN 17457).
Welding factor Z=1.0.
Tolerances according to DIN 2463.
Mill certificate according to EN 10204/3.1.B.
Supplied in lengths of 6, 12, 18 m or fixed lengths.

Application
Chemistry, food, and condensate.

Mechanical properties of **AISI 304 L:**
Density 7950 kg/m^3
Tensile strength (20 ºC) >470 N/mm^2
Yield stress (20 ºC) >180 N/mm^2
Young's modulus (20 ºC) 1.95·10^5 N/mm^2
Thermal properties:
Coefficient of expansion (20 ºC) 1.7·10^{-5} ºC^{-1}
Specific heat 0.50 kJ/kgºC
Thermal conductivity 15 W/mºC

AISI 316L (wst. 1.4404, 1.4432 or 1.4435)

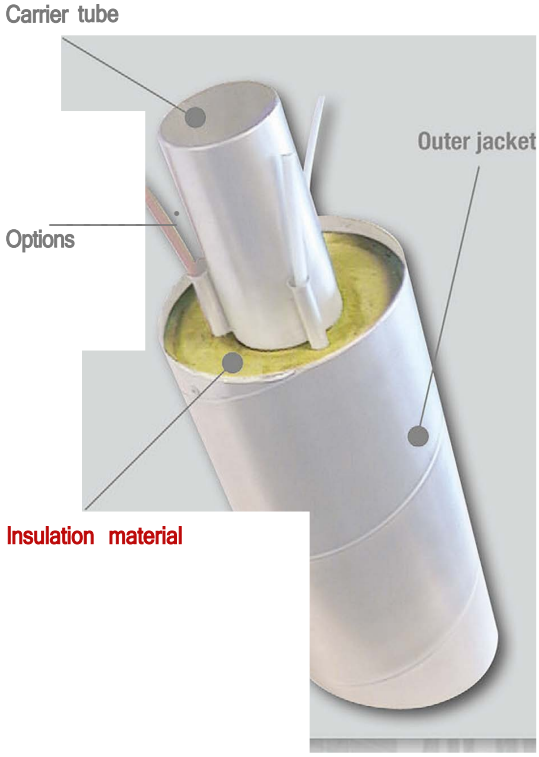
Welded tube AISI 316L according to EN 10217-7 (DIN 17457)
Welding factor Z=1.0.
Tolerances according to DIN 2463.
Mill certificate according to EN 10204/3.1.B.
Supplied in lengths of 6, 12, 18 m or fixed lengths.

Application
Chemistry, food and condensate.

Mechanical properties of **AISI 316 L:**
Density 7950 kg/m^3
Tensile strength (20ºC) >490 N/mm^2
Yield stress (20 ºC) >190 N/mm^2
Young's modulus (20 ºC) 1.95·10^5 N/mm^2
Thermal properties:
Coefficient of expansion (20 ºC) 1.7·10^{-5} ºC^{-1}
Specific heat 0.50 kJ/kgºC
Thermal conductivity 15 W/mºC

Insulation material

S.K.S. Pre-Insulated Tube Systems are insulated with polyurethane foam (PUR foam), which has extremely high insulation properties. Polyurethane has a lambda value of 0.022 at -20 °C and 0.027 at +50 °C.
The polyurethane foam is produced trom polyol and isocyanate and is HCFC/CFC free C02 blown. The foam is homogenous and complies with the functional requirements of EN 253.
PUR is unsurpassed as an insulation material tor all pipe systems between -200 °c and +140 °C, and in combination with mineral wool up to +315 °C. It is pressure-resistant, and in combination with the media tube and jacket pipe it creates a sandwich design. PUR retains its mechanica! properties unchanged tor more than 30 years.



NT and LT insulation (Normal and Low temperature)

S.K.S. tube systems are insulated with PUR faam, which ensures high insulation properties. The PUR faam must not be subject to temperatures exceeding 140° C, by continuous operation.

HT2 insulation (High Temperature)

This system is applied at temperatures above 140° C.
The pipe is designed as a two-component insulation, of which the inner part consists of a half shell of mineral wool and the outer part of a PUR foam layer.
The system operates as a bonded system and is used as a freely suspended system at maximum temperatures of 210° C or 315° C.

HT3 insulation (High temperature)

This two-component insulation is used in directly buried systems where temperatures exceed 140° C. The tube-insulation is designed as a two-component insulation, of which the inner part consists of a half shell of mineral wool and the outer part of a PUR foam layer.
HT3 operates as a sliding system and is applied at maximum temperatures of 210° C or 315° C.

PUR insulation

Material	Polyurethane foam is made from polyol and isocyanate. The foam is homogeneous with with an average cell size of max. 0.5 mm. Acc. EN253
Density (DIN3006-97)	60-80 kg/m³
Water absorption if boiled	≤10% (Vol)
Compressive strength 10% deformation	≥0,3 N/mm²
Axial sheer strength	≥0,12 N/mm²
Tangential sheer strength	≥0,20 N/mm²
Thermal conductivity at 50°C	<0,03 W/m°C
Max. operating temperature	140°C

Mineral wool

Density	Ø<323 mm 75 kg/m³
	Ø<323 mm 40 kg/m³
Water absorption	<1% (vol)
Tensile strength	0,01 N,01 N/mm²
Thermal conductivity at 50° C 0,04 W/m°C	
Max. operating temperature 315°C	

The thickness of the insulation can be adjusted for the application and will be calculated based on the heat loss due to: the heat transmission coefficient of the carrier tube, the media temperature and the influence of the environment. S.K.S. is able to engineer your tube system with a condense-free outside jacket. Every calculation will fit into one of the three *pre*-insulated tube system categories.

Heat loss

Heat loss is an important factor in the implementation of a new tube system. In this calculation it is possible to make comparisons with other insulation materials. The result shows the saving achieved and the resulting present value.

Temperature drop

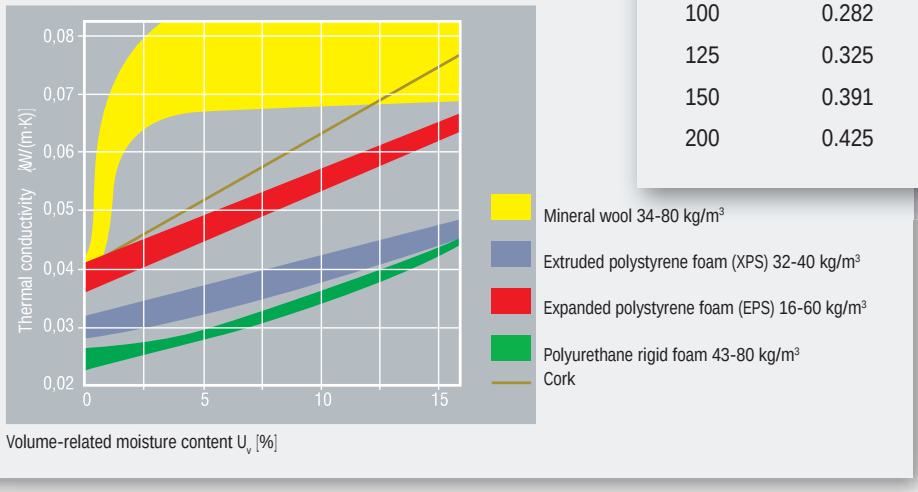
Depending on the relevant flow and the medium in the tube, the temperature will drop between the tube's inlet and outlet. It is also possible to calculate the time to cool down to a given temperature if the system is closed down.

Condensation

Insulation can be used to prevent the formation of condensation. By entering wind speed and relative atmospheric humidity, it is possible to calculate the dew-point temperature, which tells you whether condensation will occur.

Transmission coefficients

Carrier pipe	Series 1 U	Series 2 U	Series 3 U
DN	W/m °C	W/m °C	W/m °C
16	0.115	0.101	0.093
20	0.136	0.117	0.107
25	0.166	0.138	0.125
32	0.170	0.151	0.137
40	0.196	0.170	0.154
50	0.219	0.192	0.167
65	0.261	0.216	0.188
80	0.269	0.226	0.199
100	0.282	0.236	0.207
125	0.325	0.273	0.231
150	0.391	0.310	0.256
200	0.425	0.329	0.268

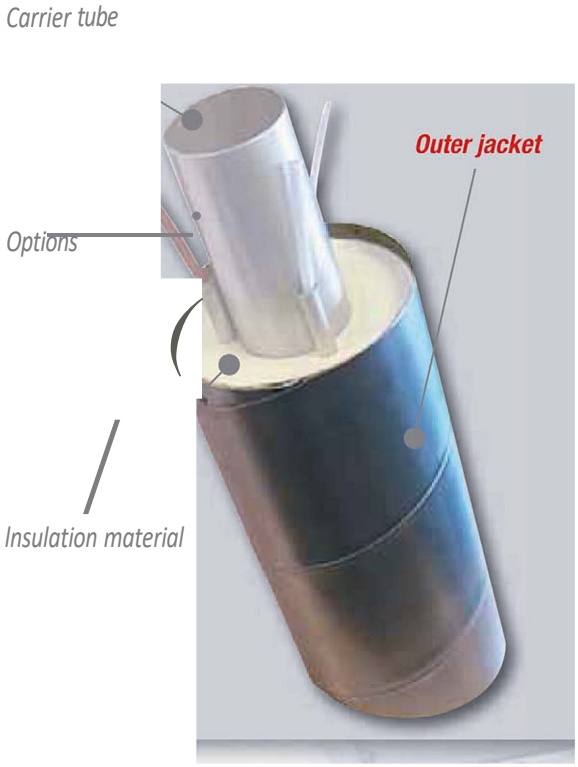


Dependence upon volume-related moisture content in % of the thermal conductivity in [W/(m·K)] *at a temperature of 10ºC*

Outside jacket

Because of contact with the environment, the outside jacket is also an important part of the pre-insulated tube system. To fulfil the demands concerning this environment and also guarantee the advantages of the system, S.K.S. offers 5 main alternatives tor the outside jacket. The choice of jacket is based on rational criteria but we can even cater tor aesthetical (optical) aspects. Compared with traditional insulation, there are advantages of all types of jacket in combination with a bonded system.

They are impact-proof, watertight, resistant to salt and chemica ls, hygienic and non-corrosive. The black HOPE jackets are UV-resistant, as a result of the addition of UV-retardant additives. The various jackets are also approved in accordance with NT Fire 4102.



The 5 alternatives are:

- HOPE black
- HOPE white
- Spiral wound Aluminium AlMg3
- Spiral wound Stainless Steel 304L
- Spiral wound Alu-zinc AZ185

HOPE jacket:

Material: High-Oensity Polyethylene tube
Fire proof: NT Fire 4102 class 2
Color: Black or white
Installation: shrinking joints (see connections)
Cleaning: Cleanable with high pressure jets (160 bar max. 60°C)
Temp. range: -200° to 315°C
Application: Black: Indoor, outdoor and underground.
White: Indoor (visual aspect).

Black HOPE is UV resistant and watertight. White HOPE is moderately UV resistant and watertight. Because of the low permeability, HOPE is a good option for cold insulation.

Density:	> 940 kg/m³
Yield stress:	> 19 N/mm'
Max. load:	(during transport) 3 N/mm²
	(continually) 0.5 N/mm²
Thermal properties:	Coefficient of expansion
	2. 10-• °C-¹
Thermal conductivity:	0.43 W/m°C
Mei! flow rate:	0.3-0.8 g/1 Omin

Spiral wound jacket:

Material: Aluminium ALMg3, Stainless steel 304L or Alu-zinc AZ185 spiral wounded tube locked 4 times on the inside. Wall thickness 0,6 / 0,8 mm.
Fire proof: NT Fire 4102 class 1, P-MPA-E-01 -603.
Color: metal
Installation: Fittings permanently sealed (see connections)
Cleaning: Cleanable with low pressure jets
Temp. range: -60° to 140°C
Application: Inside and outside freely suspended

Spiral wound jacket looks like and is easy to combine with traditional insulation. For cooling purposes the locking joint has an elastically PTFE based inlet.

Aluminium AlMg'
Specific weight: 2700 kg/m³
Thickness: 0,8 mm
Corrosion class: seawater resistant

Stainless steel 304L
Specific weight: 7950 kg/m³
Thickness: 0,6-0,8 mm
Surface IIIc: heat treated, pickled and lighlly rerolled
Surface IIId: bright annealed and lightly rerolled

Aluzinc AZ185
Specific weight: 7800 kg/m'
Thickness: 0,8 mm
Corrosion class: class 111

Connections

To make a good weld you need an insulation free length of at least 10 cm of the tube otherwise the PUR will melt. The tubes will be therefore be delivered with blank ends. If you have to saw the tube, you will need to make a length of tube free from insulation yourself.

When you have completed the welding procedure, you will have to connect the insulated tubes. The method for this depends on the outside jacket. There are 2 main ways to make a connection:

- **Connection with shrinking joints (HDPE jacket)**
- **Connection with plate material (Spiral wound jacket)**

S.K.S.

The right combination

Connections with shrinking joints

These kind of watertight connections are made for the *Pre*-insulated tube systems with a HDPE jacket (black or white). The shrinking joint is made from an elastically modified PE plastic.

These connections can be installed quickly and efficiently with the aid of a comprehensive range of standard joints. Standards joints available include straight joints, bend joints, T-joints, end caps and other accessories. The joints are just as well insulated and secure as the rest of the system when professionally installed.

A joint set consists of a shrinkable joint, PUR half shells, mastic and accessories.

We recommend that every installer should follow a training course. S.K.S. can only guarantee the advantages of the system when it is installed by a certified (trained) installer.

Connections with plate material

Connections made with plate material are also watertight and are designed for the spiral wound jackets. The plate material used is of the same material as the outside jacket. The insulation material can be mineral wool or PUR faam depending on the local specification. The plates will be axial and radial permanently fixed with self-taping screws and elastically sealed to prevent water seepage.

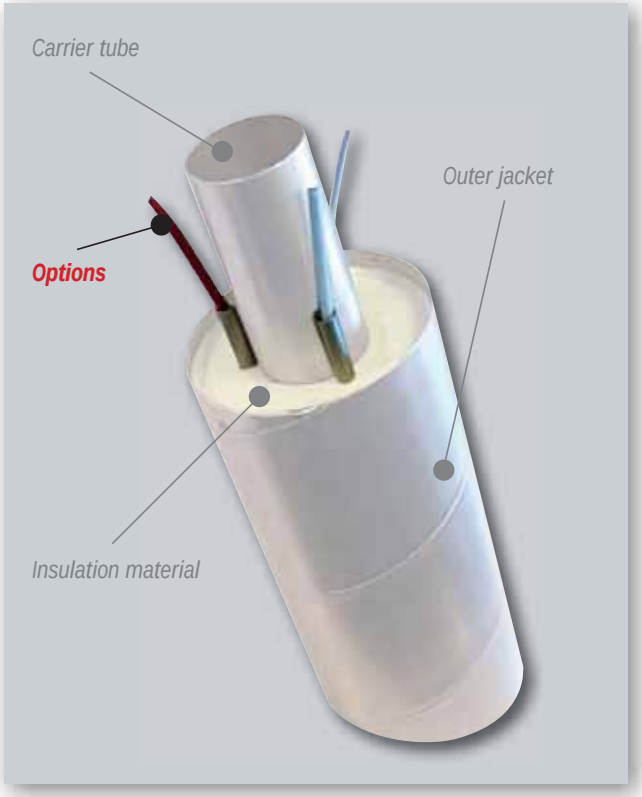
S.K.S. can only guarantee the advantages of the system when it is installed by a certified installer. We recommend that S.K.S. installs the connections. Our team will take responsibility for the connections on site and will even make the connection with traditional insulation where necessary. This kind of connection can also be used to insulate valves or other equipment.

Beware:

All connections in *pre*-insulated tube systems are permanent.

Additional options

S.K.S. has additional options available to meet your technical or aesthetic requirements. The tubes for the *pre*-insulated tube systems can be prepared tailor-made with options to maintain the required temperature, protect from frost, detect leaks and may have space saving or visu al features.



Tracer tube

There are several applications where insulation alone is not sufficient. This can be in areas where the media has to be protected from frost or just to maintain the temperature. Temperature stability can be achieved with the help of heat cables, steam or heated liquids.
In such cases the tube system can be engineered, for example with one or more tracer tubes. To ensure a sufficient conductivity for the heat transmission, the tracer tubes are connected to the carrier tube with a conductive material. The embedded tracer tube can be made of stainless steel, copper, Aluminium or PE.

Alarm cable

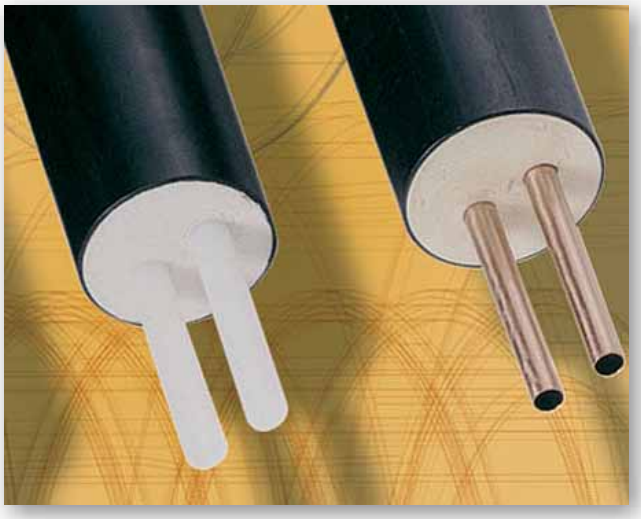
One of the best arguments for the *pre*-insulated tube systems is that they are watertight. This also means that you will not be able to detect a leak in the carrier tube before it is too late. S.K.S. has an option to equip the tubes with an alarm cable in the insulation material. This cable enables a leak to be detected and located precisely.

In-line equipment

In a modern automated system you need a lot of information from out in the field. It is therefore essential to place in-line equipment on the tube system. This is also possible and has to be specified as an option.

Space saving

It is possible to place two carrier tubes in one outside jacket. With this option you will save a lot of expansive space. This option can be engineered according specifications and can be combined with the other options.



Visual features

The visual aspect of a pipeline is often underestimated and this is why the pre-insulated tube systems can be delivered with several kinds of outside jackets. For those who have special requirements we have even more options. We can paint, coat or polish the outside jacket. But it is also possible to mark the system, for example with the heat number of the carrier tube or the name of the application.

Pipe supports

Pre-insulated tube systems can be applied as a system when they are installed in the correct way, so you need the right pipe supports.
The pre-insulated tubes have such an enormous ability to withstand pressure, that the pipe supports can be installed on the outside of the jacket. This prevents problems concerning heat and thermal bridges and there is no penetration of water or moisture.
This big advantage over traditionally insulated systems is that the pre-insulated tube systems avoid corrosion of the carrier tube, unnecessary energy losses and high maintenance costs.

S.K.S. supplies specially produced pipe supports tor pre-insulated tube systems. These pipe supports can be direct! d on the walls and ceilings or the tubes can be installed in special pipe racks.
The supports are stocked in a galvanised and a stainless steel version. 0ther qualities are available to order. The pipe supports can also be supplied in adjustable pipe racks.

The pipe supports are part of the engineering and S.K.S. will advise you in the support distances, support width, support type and fixation points.

Type of supports

The choice of support depends on the application and the material of the outer jacket. Because of the bonded aspect in the system, we have to deal with expansion or deflexion of the tubes.
Any movement of the carrier tube is forced on the insulation and the outer jacket and therefore any movement of the carrier tube is directly transferred to the pipe supports. To compensate for these movements we use gliding supports and fixation points.
Stainless steel, Aluminium and Alu-zinc have a higher permissible surface pressure then HOPE. This means that pipe supports for metal jackets are less wide then those required tor the HOPE jacket.
This width of the support can be calculated and depends on the diameter, the weight, the distance between supports, the support angle and the sum of vertical loads.

SS AISI 304/316 or galvanised

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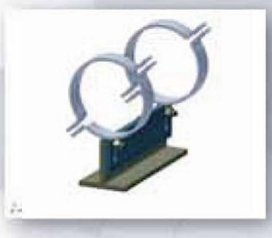


AISI 304 or galvanised

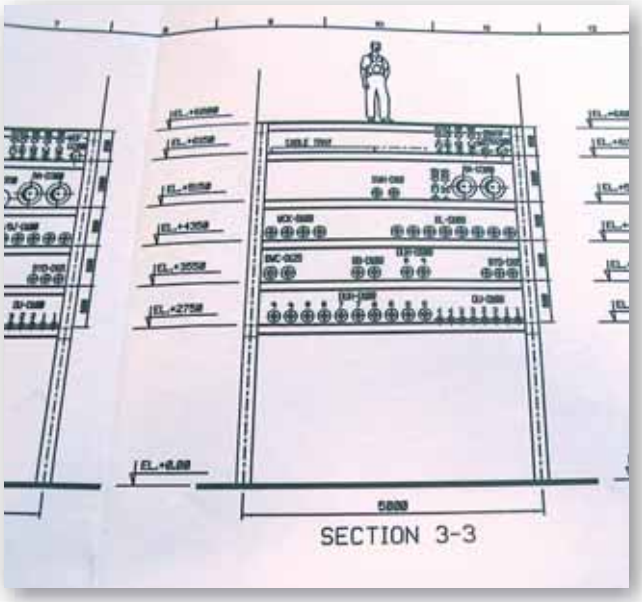
AISI 304 or galvanised

Fixation points

Depending on the application and the chosen outer jacket we have two standard alternatives for creating a fixation point. These two methods are a fixation point on the carrier tube or on the outer jacket. For HDPE jackets we recommend a fixation point on the carrier tube. All metal jackets can be supplied with a fixation point on the outside jacket.

Pipe racks

In addition to the tube system including the pipe supports, S.K.S. can supply an adjustable pipe rack. The rack can be made of galvanised or stainless steel and is prepared for all standard pipe supports for the *pre*-insulated tube systems. The racks are easy to assemble and with the adjustable legs and mounting points you can install it everywhere.



Summary

We hope that you are convinced of the advantages of the Pre-insulated tube systems. We have summarised all the important facts for you.

Arguments:

- 100% watertight
- Minimal energy costs
- Resistance against corrosion
- Stable and robust
- Minimal maintenance costs
- Quick and easy installation
- Custom made

The system is a mixture of:

- Knowledge
- Partnership
- Four adjustable components
  1. **carrier tube**
  2. **insulation**
  3. **outer jacket**
  4. **options**

Advantages of the Pre-insulated system:

• End user	Saves money
• Contractor	Bigger influence on the project
• Engineering company	More added value
• Turn key company	1 contact for entire system

Pre-insulated tube system consists of:

- All kinds of process tubes
- Custom made insulation
- 5 possible outside jackets
- Several options fit in demands
- Including the pipe supports

References:

Ask for the list. We have references in all kinds of industry and the utilities sector.

Application:

- LT -200°/140°C, Bonded system, only freely suspended
- NT -60°/140°C, Bonded system, Freely suspended and burried
- HT2 140°/315°C, Bonded system, only freely suspended
- HT3 140°/315°C, Sliding system, only directly burried

Conclusion

With 3 key words we can explain the most important advantages of all arguments. We are convinced that at least one of these advantages suits in your conclusion.

In this case we are looking forward to your inquiry and hope that we can do business on a short term. We can't hardly wait to fulfill the expectations.

Saving

- Money (investment & maintenance)
- Energy (high insulation value & no thermal bridges)
- Space (Compact insulation material & pipe racks)
- Material (no corrosion & damage)
- Communication lines (one contact)

Adjustable

- Four adjustable components
- Pre-engineering (thinking up front)
- Meets technica!, legal and aesthetic requirements
- Products available trom different categories
- Custom made

Quick & easy

- Short installation period
- Certified installers
- Logistics and project management
- Cleanable
- Combination with traditional insulation

Highly engineered products are vulnerable when in transport, handling and storage. We recommend that those involved with the transport, handling and storage of these products on your site be instructed in the characteristics and vital aspects of these products to prevent damage prior to installation. The volume and weight of the tubes make them less easy to handle. Please make sure you are well prepared for the logistics before you start with the installation.

Transport:

During transportation of the *pre*-insulated tubes and fittings, care must be taken with sharp edges or objects. The tubes must not overhang the end of a trailer or truck bed by more than 2 metres. There are a few alternative methods for packing the tubes. It is often impossible to unload the trucks manually.

Storage and internal handling:

For temporary storage, tubes should be stacked on a flat surface or on wooden slats, either in the shape of a pyramid or straight-sided with slats between each layer. To avoid damaging the tubes when lifting them, lift the tube mechanically using at least two woven straps.
White jacket procedures should be applied to the storage and handling of the tubes, as they are very sensitive to impurities.

Tools

In addition to the tools required for welding the tubes, you will need extra tools for the *pre*-insulated tube system. Besides welding you will also have to connect the insulation. As mentioned in the section "connections" on page 20 and 21, there are 2 kinds of connections. For each kind of connection you will need different tools.

Connections with shrinking joints:

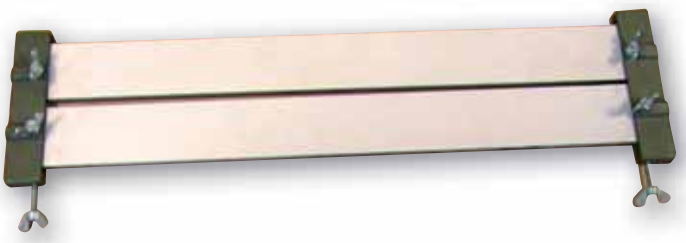
For installing the shrinking connections you need the right tools. This is a small list of mostly standard tools which can be supplied by S.K.S.

Tool set for straight, bend, end and reducing joints:
(article number 99509001)

- 2 pieces of 38 mm canvas tape
- 2 insulation knives
- 2 insulation saws
- 1 53 mm torch set
- 1 regulating valve
- 10 m gas-tight hose
- 2 hose connections with clamp (torch and valve)

Additional tool set for Tee joint: (article number 99509002)

- set ceramic plates
- set armatures



Connections with plate material:

Making a connection with plate material is similar to making a traditional connection, but because of the guarantees for the system we recommend to that S.K.S. or a certified installer makes these connections. They have the skills and the right tools and material to make the connection correctly.

Project (end custumor):	
Contractor:	
Contact person:	
Drawings:	
Requested deliverytime:	

Process:	
Ambient temperature °C:	°C
Environment inside / outside:	
Flow temperature °C:	°C
Return temperature °C:	°C
Pressure (bar):	bar
Flow m^3/h:	m^3/h
Depth mtr. (burried system):	mtr.
Media:	

System	
NT:	
LT:	
HT2:	
HT3:	
Burried:	
Free end:	Standard (100 / 150mm)
Other dimension:	

Media tubes:	
Stainless steel dairy (DIN11850):	
Stainless steel industrial (EN10217-7):	
Steel 37.0 (EN10217-2)	
Steel 35.8 (EN10216)	
Others:	
Custumor delivered tube:	
Length: (standard 6 mtr)	

Insulation	
Series 1	
Series 2	
Series 3	
Personal protection	
Others:	

Jacket:	
Black HDPE:	
White HDPE:	
Aluminium	
Stainless steel:	
Aluzinc:	

Welding of pre-insulated components:	
Weld specification:	
Pre-fabbed by:	

Options:	
Tracing:	
Tracertube:	
Frost protection:	
Alarmcable:	
Fixpoints:	
Others:	

Trace-ability	
None:	
Marking:	
Marking inc. weld:	

Tests:	
Welds:	
External:	

Certificates	
None	
3.1B:	
Others:	

Engineering	
S.K.S.	
Not applicable	
Others:	

Remarks	