∅ 12-108 mm

SYSTEM **KAN-therm**

Steel

Traditional material
in modern technology

EN 02/2019

TECHNOLOGY OF SUCCESS

ISO **9001**

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System KAN-therm Steel is a system made of carbon steel pipes and fittings of diameters 12 to 108 mm. Pipes and fittings produced of high quality carbon steel covered with thin zinc layer which protects external surface agains corrosion.

Modern connection technology

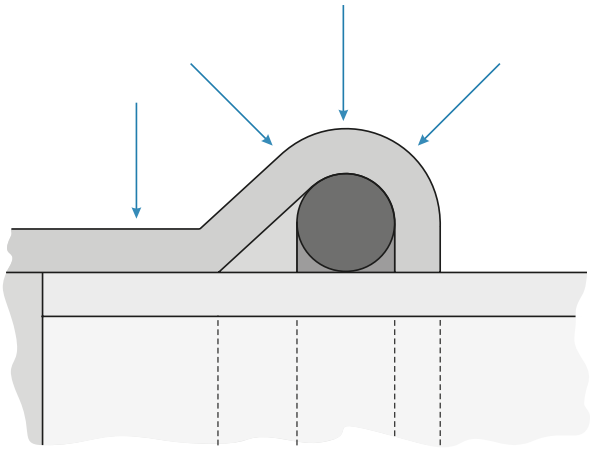
"Press" technology used in System KAN-therm Steel enables to make fast and reliable connections by pressing fittings using widely available press tools, and to eliminate twisting and welding of individual elements. The system permits a very quick assembly even when using pipes and fittings in large diameters.

System KAN-therm Steel pipes and fittings are made of thin-walled steel, which significantly decreases weight of individual elements and facilitates system assembly.

Connecting elements in "press" technology allows to obtain connections with minimized pipe section narrowing, which significantly decreases waste of system pressure and creates excellent hydraulic conditions.

Long-lasting connection technology

Connection leak tightness in System KAN-therm Steel is provided by special O-Ring seals and a three-point crimping profile „M".



Application possibilities

- closed water heating installation (cannot be used for potable water installations),
- closed cooling water systems.

Advantages

- quick and reliable system assembly without welding and twisting,
- wide range of pipe and fitting diameters up to 108 mm,
- wide range of operating temperatures: from -35°C to 135°C,
- high operating pressure up to 16 bar,
- compatible with plastic systems KAN-therm Press and Push,
- lightweight pipes and fittings,
- system high aesthetics,
- resistance to mechanical damage.

Fitting assembly

1 **Pipe cutting**

Pipes should be cut perpendicular to their axes using pipe roll-cutter (full cut, with no breaking off nicked pipe segments). Using other tools is permissible provided the cut is perpendicular and cut edges are not damaged (no breaking off, no material decrements or other deformations of pipe section). Tools that emit a lot of heat, e.g. a flame torch, an angle grinder, etc., cannot be used.

2 Beveling

Using a hand operated stripping tool (for 76,1-108 mm half-rounded steel file), bevel outside and inside the tip of the cut pipe, and remove all file dust that can damage an O-Ring during assembly. Stripping tool may also be mounted on electric machines (for instance electric dril).

3 Marking the insertion depth of the pipe in the fitting

In order to obtain proper connection strength it is necessary to keep the correct insertion depth (Tab.1, Fig 1) of the pipe in the fitting (it should be slid home). To make sure the pipe is properly slid into the fitting during pressing, mark the required insertion depth with a pen marker. After the connection have been made, the marking should be visible just next to edge of the fitting. Also, there are special markers for marking the insertion depth.

4 Control

Before assembly, check visually that there is an O-Ring in the fitting, whether it is not damaged, and whether there are no file dust or any other sharp objects which can cause damage to the O-Ring during assembly. In order to proper assembling it is necessary to check the minimal allowed distance between the fittings according to Table. In order to proper assembling it is necessary to check the minimal allowed distance between the fittings according to Table 1. Fig.1).

5 Pipe and fitting assembly

Before making the connection, axially insert the pipe into the fitting to a marked depth (To make the assembly easier it is possible to slightly twist the pipe in relation to the fitting).

Using any kinds of oils, lubricating oils and fats in order to make the montage of the pipe into the fitting easier is not allowed (it is allowed to use only water or spoiled soap - recommended in case of pressure test by air). In the case of making many connections (inserting pipes into fittings and pressing) it is very important to watch the pipe insertion depth. To do so watch previously made markings on pipes near fitting edges.

6 Making a press connection

Before the beginning of the process of making the press connection, please check the efficiency of tools. Recommended is the usage of pressing machine and jaws provided by the System KAN-therm.

Always choose the suitable size of the jaw to the diameter of executing connection. The jaw should be placed on the fitting in the way, which will ensure that the grooves in the jaw will cover the space, where are the O-Rings placed (raised parts of the fitting). After start of pressing, the process takes place automatically and cannot be stopped. If for some reasons the process of the pressing will be aborted, the connection need to be disassembled (cut out) and then the new connection should be executed one more time in correct way. If the contractors have different machines and jaws than those supplied by KAN, every use of them must be consulted with the KAN company individually.

7 **Making a press connection in range 76,1–168 mm Preparing the jaw**

To make a press connection of the three biggest dimensions of the Steel (76,1; 88,9; 108) a special jaws should be used (tetramerous) and the Klauke pressing machine. The jaw after release should be unlocked by removing the special bolt.

8 **The unfolded jaw is put onto the shaped element. The press jaw has a groove which should fit the flange fittings.**

Caution: In the case of the 76,1-108 jaws for Klauke UAP100 press tool, the plate with printed jaw size (visible in the figure) should be always located toward the pipe side.

9 **After the correct assembling the jaw onto the fitting, the apparent need be is locked using the special bolt. At this moment the jaw is ready to do the connection.**

10 **Connection of the press tool to the jaw**

The press tool should be connected to the jaw. It is essential to ensure that the press tool is properly connected to the jaw in accordance with the instructions attached to the specific tool.

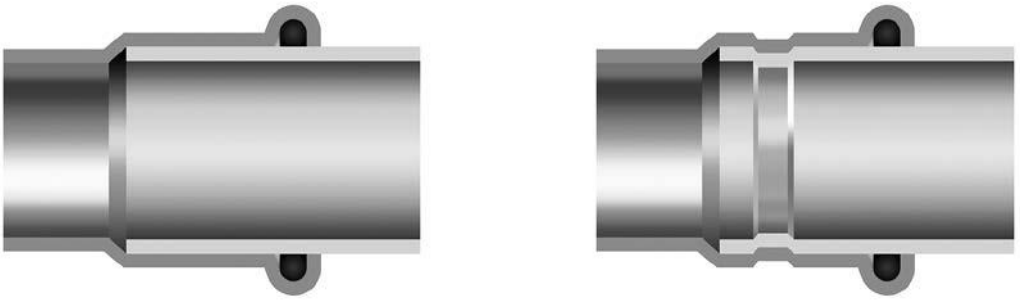
The press tool connected to the jaw may be started to achieve the full connection pressing.

11 Pressing

The time of pressing is approx. 1 minute (for diameters: 76,1-108 mm). After starting the press tool the pressing process cannot be stopped. If for some reason the process of pressing is interrupted, the connection must be removed (cut) and performed new in the proper manner. After the pressing the press tool automatically returns to its original position. Then you need to remove the machine from the jaw. To remove the jaw from the fitting you have to unlock it again by removing the pin (diameter 76,1-108 mm), then unfold. The jaws should be stored in the cases in safe mode - locked.

Check and lubricate the equipment before starting work and during the intervals determined by the producer.

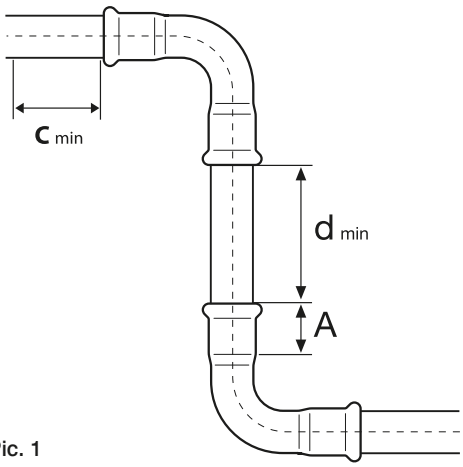
Press conection before and after press



Mounting distance

Table 1. Pipe insertion depth in the fitting and minimum distance between pressed fittings

Ø [mm]	A [mm]	d_{min} [mm]
12	17	10
15	20	10
18	20	10
22	21	10
28	23	10
35	26	10
42	30	20
54	35	20
64	50	30
66.7	50	30
76.1	55	55
88.9	63	65
108	77	80



Pic. 1

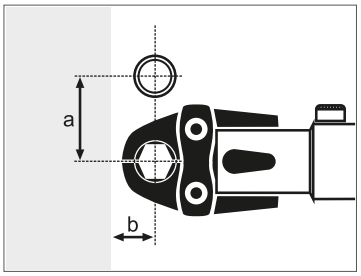
A – Pipe insertion depth in the fitting,

d_{min} – minimum distance between fittings allowing for press correctness

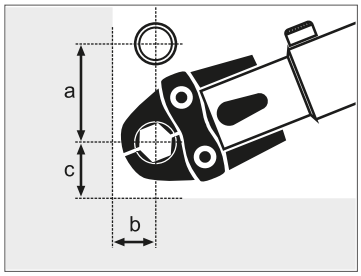
Table 2. Minimum assembly distances

Ø [mm]	Pic. 2		Pic. 3		
	a [mm]	b [mm]	a [mm]	b [mm]	c [mm]
12/15	56	20	75	25	28
18	60	20	75	25	28
22	65	25	80	31	35
28	75	25	80	31	35
35	75	30	80	31	44
42	140/115*	60/75*	140/115*	60/75*	75
54	140/120*	60/85*	140/120*	60/85*	85
64	145*	110*	145*	100*	100*
66.7	145*	110*	145*	100*	100*
76.1	140*	110*	165*	115*	115
88.9	150*	120*	185*	125*	125
108	170*	140*	200*	135*	135

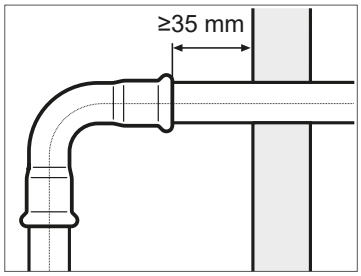
*applies to four-part pressing jaws



Pic. 2



Pic. 3



Pic. 4

Tools

Depending on the diameter, KAN-therm provides various configuration of tools. In order to select optimal set of tools, please follow chart:

Tab. 3 Selection of tools table: System KAN-therm Steel & Inox

Brand	Press machine		Diameter [mm]	Press jaws / collars		Adapter		Type of System KAN-therm			
	Marking	Code		Marking	Code	Marking	Code	Steel	Inox	Steel Sprinkler	Inox Sprinkler
NOVOPRESS	ACO203XL EFP203 *	1948267181 1948267210	12*	[J] M	1948267134	-	-	+	+	-	-
			15*	[J] M	1948267135	-	-	+	+	-	-
			18*	[J] M	1948267137	-	-	+	+	-	-
			22*	[J] M	1948267139	-	-	+	+	+	+
			28*	[J] M	1948267141	-	-	+	+	+	+
			35*	[J] M	1948267143	-	-	+	+	-	-
			35*	HP	1948267124	ZB203	1948267000	+	+	+	+
			42*	M	1948267119			+	+	-	-
			42*	HP	1948267126			+	+	+	+
			54*	M	1948267121			+	+	-	-
			54*	HP	1948267128			+	+	+	+
			66,7	M	1948267089	ZB221	1948267005	+	-	-	-
			76,1	M	1948267145			+	+	-	-
			88,9	M	1948267044			+	+	-	-
			108	M	1948267038	ZB221 ZB222	1948267005 1948267007	+	+	-	-
	ACO102 ACO103	1948055007 1948267208	15	[J] M	1948267093	-	-	+	+	-	-
			18	[J] M	1948267095	-	-	+	+	-	-
			22	[J] M	1942121002	-	-	+	+	-	-
			28	[J] M	1948267097	-	-	+	+	-	-
	ECO301	1948267163	12	[J] M	1948267084	-	-	+	-	-	-
			15	[J] M	1948267085	-	-	+	+	-	-
			18	[J] M	1948267087	-	-	+	+	-	-
			22	[J] M	1948267164	-	-	+	+	+	+
			28	[J] M	1948267165	-	-	+	+	+	+
			35	HP Snap On	1948267124	ZB 303	1948267166	+	+	+	+
			42	HP Snap On	1948267126			+	+	+	+
			54	HP Snap On	1948267128			+	+	+	+
			66,7	M	1948267089	ZB 323	1948267009	+	+	-	-
	ACO401 ACO403	1948267151 1948267209	76,1	HP	1948267100	-	-	+	+	+	+
			88,9	HP	1948267102	-	-	+	+	+	+
			108	HP	1948267098	-	-	+	+	+	+

[J] - dual jaw, the remaining parts are band jaws and may require cooperation with the adapter

Tab. 3 Selection of tools table: System KAN-therm Steel & Inox

Brand	Press machine		Diameter [mm]	Press jaws / collars		Adapter		Type of System KAN-therm			
	Marking	Code		Marking	Code	Marking	Code	Steel	Inox	Steel Sprinkler	Inox Sprinkler
REMS	Power Press SE Aku Press, Power Press ACC	1936267160, 1942267002 1936267152	12	[J] M	1948267046	-	-	+	+	-	-
			15	[J] M	1948267048	-	-	+	+	-	-
			18	[J] M	1948267052	-	-	+	+	-	-
			22	[J] M	1948267056	-	-	+	+	-	-
			28	[J] M	1948267061	-	-	+	+	-	-
			35	[J] M	1948267065	-	-	+	+	-	-
			42	[J] M	1948267067	-	-	+	+	-	-
			54	[J] M	1948267069	-	-	+	+	-	-
KLAUKE	UAP100	1948267159	67	KSP3	1948267078	-	-	+	-	-	-
			76,1	KSP3	1948267080	-	-	+	+	-	-
			88,9	KSP3	1948267082	-	-	+	+	-	-
			108	KSP3	1948267074	-	-	+	+	-	-

[J] - dual jaw, the remaining parts are band jaws and may require cooperation with the adapter

REMS tools:

1. Power Press ACC machine
2. Aku Press machine
3. Power Press SE machine
4. Press jaw M12-35 mm
5. Press jaw M42-54 mm

NOVOPRESS tools:

1. ACO 102 machine
2. ACO 103 machine
3. Press jaw M15-28 mm

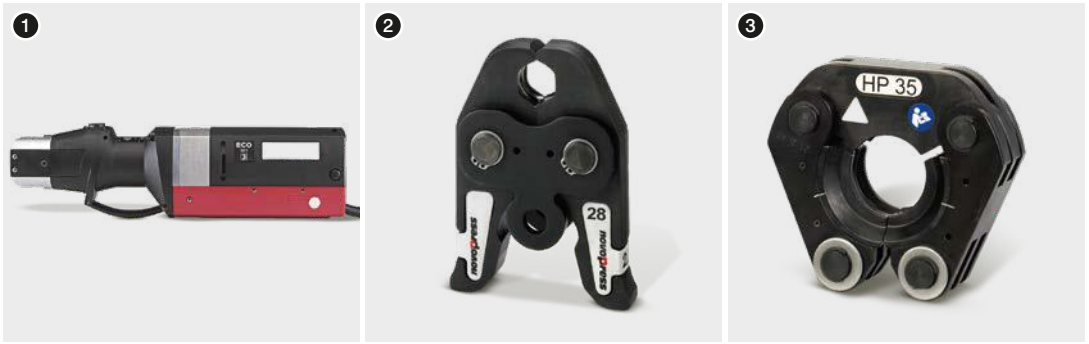
1. ACO203XL machine
2. Press jaw PB 2 M12-35 mm
3. Collar HP/M 35-108 Snap On

4. Adapter ZB 203
5. Adapter ZB221, ZB222

1. EFP203 machine
2. Press jaw PB2 M12-35 mm
3. Collar HP/M 35-54 Snap On

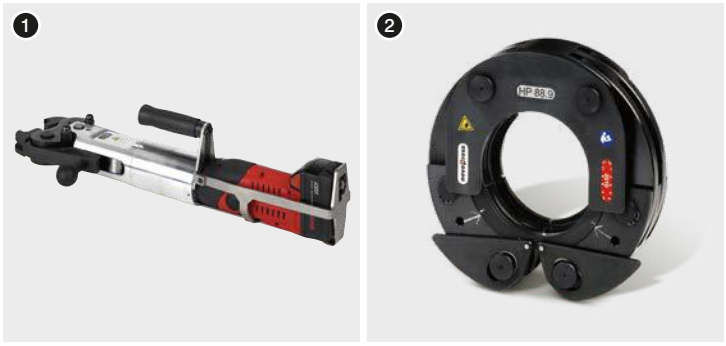
4. Adapter ZB203

1. ECO 301 machine
2. Press jaw M12-28 mm
3. Collar HP/M 35-66,7 Snap On



4. Adapter ZB 303
5. Adapter ZB 323

1. ACO 401/ACO 403 machine
2. Collar HP 76,1,-168,3 Snap On



Narzędzia KLAUKE:

1. UAP100 machine
2. Collar KSP3 76,1-108 mm

Tools - safety

All tools must be applied and used in accordance with their purpose and the manufacturer's instructions.

Use for other purposes or in other areas are considered to be inconsistent with the intended use.

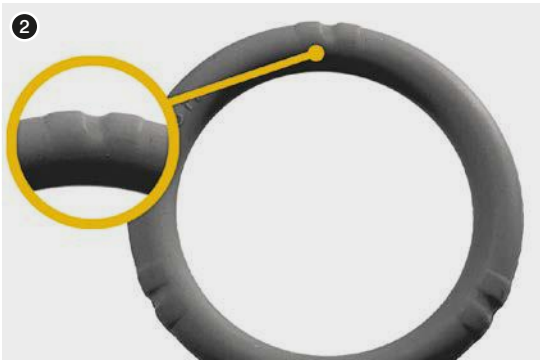
Intended use also requires compliance with the instructions, conditions of inspection and maintenance and relevant safety regulations in their current version.

All works done with tools, which do not meet the application compatible with the intended purpose may result in damage to tools, accessories and pipes. The consequence may be the leak and / or damage.

LBP Function

All the KAN-therm Steel System fittings have LBP function (signaling unpressed connections - LBP-Leak Before Press). In scope of 12–54 mm diameters the function is implemented by means of special construction of O-rings. Thanks to their special grooves, the LBP O-rings guarantee optimal connection control during pressure test.

Unpressed connections are leaky and therefore easy to locate. In diameters over 54 mm the LBP function is realized by means of an appropriate fitting construction (fitting socket ovalization).



1. The activity of O-Rings with the function of signallings not pressed connections (LBP).

2. O-Rings with the function of signallings not pressed connections (LBP)

Detailed information

Pipes and fittings - material

Carbon steel RSt 34-2 (1.0034 acc. DIN EN 10305-3), pipes externally zinc coated (Fe/Zn 88), zinc layer thickness 8–15 μm.

O-Rings and flat gaskets

O-Ring	Properties and work parameters	Application
EPDM (butyl rubber) 	color: black max. operating pressure: 16 bar operating temperature: -35°C to 135°C short duration: 150°C	potable water hot water treated water (softened, decalcified, distilled, with glycol up to 50%*) compressed air (dry)
FPM / Viton (fluorine rubber) 	color: green max. operating pressure: 16 bar operating temperature: -30°C to 200°C short duration: 230°C	solar systems with glycol* compressed air fuel oil vegetable fat engine fuels **Caution!** Not suitable for pure hot water applications.

O-Ring	Properties and work parameters	Application
Flat gasket FPM Viton 	color: green max. operating pressure: 16 bar operating temperature: -30°C to 200°C short duration: 230°C	solar installations (glycol) compressed air heating oil vegetable fats motor fuels Caution!! do not use in clean hot water systems.

Fittings come with standard EPDM O-Rings.

* Glycol mixtures with a concentration up to 50% are permissible if they received written approval from KAN company.

For special applications, Viton O-Rings are delivered separately. In case of exchanging the standard EPDM to the VITON O-Rings, it is not allowed to use again the dismounted O-Rings. Areas of application that are outside the elementary scope of the closed heating installations, should be always consulted with the company KAN.

Elongation and thermal conductivity data

Material	Linear elongation coefficient [mm/(m×K)]	Elongation of 4 m segment at 60°C [mm]	Thermal conductivity [W/(m²×K)]
Steel	0.0108	2.59	58

Guidelines for applications

- KAN-therm Steel system pipes and fittings made of 1.0034 carbon steel cannot be used in installations exposed to additional mechanical loads (e.g. hanging on pipelines, devastations, etc.).
- KAN-therm Steel pipes cannot be bent when warm. Cold bending is permissible provided the minimum bending radius is kept (R=3.5×dz). Do not expose pipe external surface to prolonged direct moisture during storage and use.
- Pipes over Ø28 mm should not be bent.
- Use ready-made pipe bends or 90° and 45° elbows offered by System KAN-therm Steel.
- It is not allowed to cut pipes using tools which emit a lot of heat, e.g. flame torches or grinders. To cut KAN-therm Steel pipes use only pipe cutters (hand operated and mechanical).
- Systems filled with water should not be emptied. In the case a system has to be emptied after a pressure test, it is advised to perform pressure tests using compressed air.
- When KAN-therm Steel system is concealed in building elements, pipes and fittings should be tightly insulated, allowing for compensation of thermal elongation and building chemicals protection.
- If pipes and fittings of System KAN-therm Steel may contact with water or other corrosive environment it is necessary to use tight anti-corrosion protection. The thickness of used insulation should make possible free thermal movement of installation – compensation.
- In the case of transporting chemical substances the possible use of KAN-therm Steel pipes should be consulted with KAN Technical Department.
- System KAN-therm Steel installations require potential equalization.

Screw connections and joining with other KAN-therm Systems

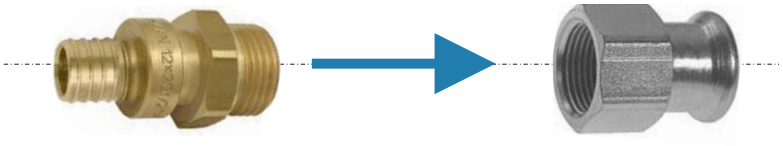
System KAN-therm Steel offers the wide range of male and female threaded fittings. Because in the Steel and Inox fittings threads are the cone-shaped, to make a connections with KAN-therm Push and Press brass fittings, use only male threads with the small quantity of tow at the brass side.

To not stress the press connection, it is advised to make a screw connection before the press one.

Recommended method of connecting plastic systems (Push, Press) with steel systems (Steel, Inox) is a properly made screw connection.

Male brass fitting **System KAN-therm Push, KAN-therm Press**

Female steel fitting **System KAN-therm Steel, KAN-therm Inox**



Thread sealing

It is advised to seal threaded connections with such an amount of tow, that leaves the thread tops not covered. Using too much tow may lead to thread damage. By winding tow just after the first thread ridge you can avoid skew screwing and damaging the thread.

Caution

Do not use chemical sealants or glues.

Elements of the System KAN-therm Steel can be assembled (through the screw or flanged connections) with elements made of others materials (see the table below).

Possibility of connections for Systems KAN-therm Steel and Inox with other materials

Type of installation		Pipes/Fittings			
		Copper	Bronze/Brass	Carbon steel	Stainless steel
Steel	closed	yes	yes	yes	yes
	open	no	no	no	no
Inox	closed	yes	yes	yes	yes
	open	yes	yes	no	yes

Remember, that connecting directly the elements made of the stainless steel with the elements made of zinc plated carbon steel (eg. pipes) can lead to corrosion. This process can be eliminated by using the plastic inserts or independent metal inserts (bronze, brass) with minimal length of 50 mm (eg. using the brass ball valve).

Flange connections

Table of Steel flange connections

Code	Size	Amount of screws/ nuts	Screw size	Screw class	Nut class	Amount of washers	Flange	Flat O-Ring
1509091000	35 DN32 PN16	4	M16	8.8	8	8	DN32	DN32 EPDM
1509091001	42 DN40 PN16	4	M16	8.8	8	8	DN40	DN40 EPDM
1509091002	54 DN50 PN16	4	M16	8.8	8	8	DN50	DN50 EPDM
1509091007	64 DN65 PN16	4	M16	8.8	8	8	DN65	DN65 EPDM
1509091005	66,7 DN65 PN16	4	M16	8.8	8	8	DN65	DN65 EPDM
1509091003	76,1 DN65 PN16	4	M16	8.8	8	8	DN65	DN65 EPDM
1509091004	88,9 DN80 PN16	8	M16	8.8	8	16	DN80	DN80 EPDM
1509091010	108 DN100 PN16	8	M16	8.8	8	16	DN100	DN100 EPDM

Pipeline assembly

Maximum distances between attachment points are presented in Table 4:

Table 4 Maximum distances between pipeline attachment points

Pipe diameter [mm]	Distance between attachment points [m]
12	1.00
15	1.25
18	1.50
22	2.00
28	2.25
35	2.75
42	3.00
54	3.50
64	3.75
66.7	4.25
76.1	4.25
88.9	4.75
108	5.00

Attachment points can be done as:

— slidable points PP - slidable points should enable free axial motion of the pipeline (caused by thermal motions), that is why they shouldn't be fixed next to the fittings (minimal distance from fitting flange must be higher than maximum elongated of pipeline). The slidable point can be made as "unscrewed" metal clamps with rubber pads,

- fixed points PS - to make fixed point, the metal clamp with rubber pad should be used, it should enables precise and reliability stabilization of the pipe on the whole circuit. The metal clump should be maximally tighten on the pipe,
- attachment points preventing the pipeline from moving downwards; used if the pipeline movement on compensation arm length was blocked by required PP position.

Fixed (PS) and slidable (PP) points

- fixed points should prevent any movement of pipelines and should be fixed next to fittings (at both sides of a fitting, e.g. coupling, tee connection),
- fixed or slidable points cannot be fixed directly onto fittings,
- when fixing PSs near tee connections make sure that clamps blocking the pipeline are not fixed onto branches of smaller diameters than one dimension in relation to the pipeline (forces induced by large diameter pipes can damage small diameters), PPs enable only axial motion of the pipeline (they should be treated as fixed points for perpendicular direction to the pipeline axis) and should be made by clamps,
- PPs should not be fixed next to fittings because this may block thermal motions of the pipeline,
- remember that PPs prevent the pipeline from moving transverse to its axis and that is why their position may determine compensation arms length.

Elongation compensation

Along with water temperature rise ΔT pipelines become elongated by ΔL value. Thermal elongatione ΔL causes pipeline deformation on expansion compensation length A. Expansion compensation length A should not cause excessive stresses in the pipeline and depends on the pipeline external diameter, thermal elongation ΔL and a linear expansion coefficient for a given material. Elongations ΔL in function of pipe length L and temperature rise ΔT are presented in Table 5:

Table 5 Total length elongation ΔL [mm] – System KAN-therm Steel

L [m]	ΔT [°C]									
	10	20	30	40	50	60	70	80	90	100
1	0.11	0.22	0.32	0.43	0.54	0.65	0.76	0.86	0.97	1.08
2	0.22	0.43	0.65	0.86	1.08	1.30	1.51	1.73	1.94	2.16
3	0.32	0.65	0.97	1.30	1.62	1.94	2.27	2.59	2.92	3.24
4	0.43	0.86	1.30	1.73	2.16	2.59	3.02	3.46	3.89	4.32
5	0.54	1.08	1.62	2.16	2.70	3.24	3.78	4.32	4.86	5.40
6	0.65	1.30	1.94	2.59	3.24	3.89	4.54	5.18	5.83	6.48
7	0.76	1.51	2.27	3.02	3.78	4.54	5.29	6.05	6.80	7.56
8	0.86	1.73	2.59	3.46	4.32	5.18	6.05	6.91	7.78	8.64
9	0.97	1.94	2.92	3.89	4.86	5.83	6.80	7.78	8.75	9.72
10	1.08	2.16	3.24	4.32	5.40	6.48	7.56	8.64	9.72	10.80
12	1.30	2.59	3.89	5.18	6.48	7.78	9.07	10.37	11.66	12.96
14	1.51	3.02	4.54	6.05	7.56	9.07	10.58	12.10	13.61	15.12
16	1.73	3.46	5.18	6.91	8.64	10.37	12.10	13.82	15.55	17.28
18	1.94	3.89	5.83	7.78	9.72	11.66	13.61	15.55	17.50	19.44
20	2.16	4.32	6.48	8.64	10.80	12.96	15.12	17.28	19.44	21.60

„L", „Z", and „U" compensator selection

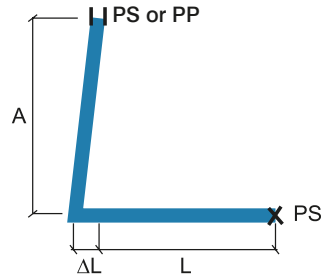
Table 6 Required expansion compensation length A [mm] for KAN-therm Steel System

Elongation values ΔL [mm]	External pipe diameter d_z [mm] Required expansion compensation length A [mm]												
	12	15	18	22	28	35	42	54	64	66.7	76.1	88.9	108
2	220	246	270	298	337	376	412	468	509	520	555	600	661
4	312	349	382	422	476	532	583	661	720	735	785	849	935
6	382	427	468	517	583	652	714	810	882	900	962	1039	1146
8	441	493	540	597	673	753	825	935	1018	1039	1110	1200	1323
10	493	551	604	667	753	842	922	1046	1138	1162	1241	1342	1479
12	540	604	661	731	825	922	1010	1146	1247	1273	1360	1470	1620
14	583	652	714	790	891	996	1091	1237	1347	1375	1469	1588	1750
16	624	697	764	844	952	1065	1167	1323	1440	1470	1570	1697	1871
18	661	739	810	895	1010	1129	1237	1403	1527	1559	1665	1800	1984
20	697	779	854	944	1065	1191	1304	1479	1610	1644	1756	1897	2091
22	731	817	895	990	1117	1249	1368	1551	1689	1724	1841	1990	2193
24	764	854	935	1034	1167	1304	1429	1620	1764	1800	1923	2079	2291
26	795	889	973	1076	1214	1357	1487	1686	1836	1874	2002	2163	2385
28	825	922	1010	1117	1260	1409	1543	1750	1905	1945	2077	2245	2475
30	854	955	1046	1156	1304	1458	1597	1811	1972	2013	2150	2324	2561
32	882	986	1080	1194	1347	1506	1650	1871	2036	2079	2221	2400	2645
34	909	1016	1113	1231	1388	1552	1700	1928	2099	2143	2289	2474	2727

Table 6 presents required expansion compensation length A for different thermal elongation values ***ΔL*** and pipe external diameters ***dz.***

Rules for selection of different types of compensators are given below:

„L" type compensator



A – flexible arm length

PP – sliding support (allows only axial movement of a pipeline)

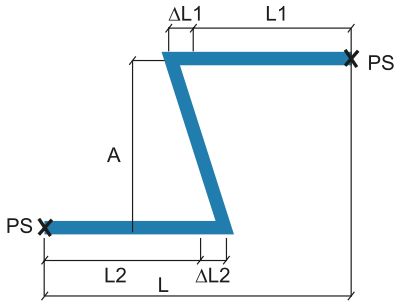
PS – fixed point (prevents any movement of a pipeline)

L – the initial length of a pipelineu

ΔL – pipeline thermal elongation

For compensation arm ***A*** dimensioning, a substitute length ***Lz=L*** is taken, and for ***Lz*** length the thermal elongation value ***ΔL***, is determined from Tab. 5. Next, the expansion compensation length ***A*** is determined on the basis of Tab. 6.

„Z" type compensator



A – flexible arm length

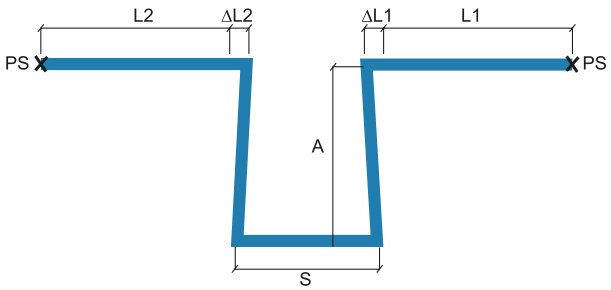
PS – fixed point (prevents any movement of a pipeline)

L – the initial length of a pipelineu

ΔL – pipeline thermal elongation

For compensation arm ***A*** dimensioning, ***L1*** and ***L2*** sum is taken as a substitute length ***Lz=L1+L2*** and for Lz length a substitute ***ΔL*** is determined on the basis of Tab. 5. Next, the expansion compensation length ***A*** is determined on the basis of Tab. 6.

„U" type compensator



A – flexible arm length

PS – fixed point (prevents any movement of a pipeline)

L – the initial length of a pipelineu

ΔL – pipeline thermal elongation

S – U type compensator width

In case of placing fixed point ***PS*** in the section of compensator length ***S*** or compensation arm ***A*** dimensioning, the greater value from ***L1*** and ***L2*** is taken as a substitute length for ***Lz: Lz=max(L1, L2)*** and for this length the substitute elongation ***ΔL*** is determined on the basis of Tab. 5, and then the length of compensation arm ***A*** is determined on the basis of Tab. 6.

Compensator width: ***S = A/2***.