

### Installation methods

In practice, installation methods 1, 2 and 4 can be used to install double pipes, see catalogue section 4.

Installation method 1 (expansion bends) should only be used where expansion offsets are installed ahead of building lead-ins or where bends occur naturally in the system.

Installation method 2 (heat prestressing) should be used where a system with relatively low axial stresses is required.

With installation methods 1 and 2, axial stresses in the steel pipes will not exceed 180 N/mm<sup>2</sup> if the other conditions described in the catalogue are complied with.

Installation method 4 (cold installation) can be used where axial stresses higher than 180 N/mm<sup>2</sup> are acceptable.

When installation methods 1 and 4 are used, it may be necessary to install expansion offsets on the branch line.

Cold installed systems (installation method 4) with a temperature difference (resulting  $\Delta t$ ) between design temperature and installation temperature of max 80°C should be installed in accordance with the rules applicable for heat prestressing (installation method 2).

### System description

A double pipe consists of two steel carrier pipes and a HDPE jacket pipe, which are cast into a fixed sandwich structure with polyurethane insulation.

Double pipes are usually orientated with the supply pipe lowermost.

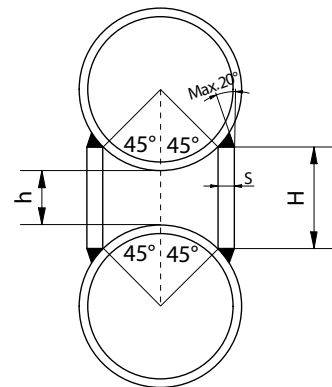
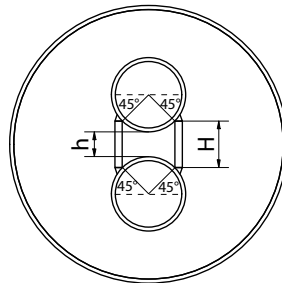
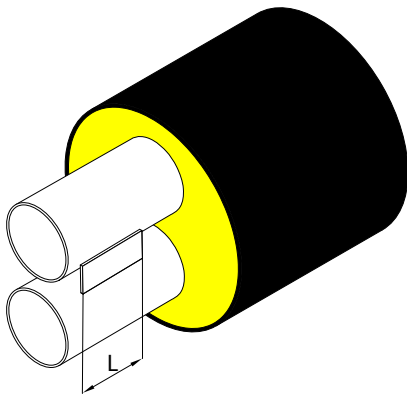
## Steel pipes – double – installation rules

### 7.1.1

As the supply and return carrier pipes are exposed to different temperatures, the fatigue strength of the system require that the two carrier pipes must be fixed to one another at direction changes and at the ends of each pipe section.

The two carrier pipes are fixed by means of two fixing plates that are welded on between the pipes acc. to the table.

DN	d outside mm	Plate length L mm	Carrier pipe spacing h mm	Plate height H mm	Plate width s mm
20	26,9 + 26,9	50	19	27	4
25	33,7 + 33,7	50	19	29	4
32	42,4 + 42,4	60	19	31	4
40	48,3 + 48,3	60	19	33	5
50	60,3 + 60,3	70	20	38	5
65	76,1 + 76,1	90	20	42	5
80	88,9 + 88,9	110	25	51	5
100	114,3 + 114,3	120	25	58	6
125	139,7 + 139,7	150	30	71	6
150	168,3 + 168,3	200	40	89	6
200	219,1 + 219,1	230	45	109	8



isoplus double pipe system components are designed for a temperature of max. 120°C and temperature difference between supply and return pipes of max. 60°K.

isoplus warranty obligations are voided if these temperature limits are exceeded.

All isoplus pre-insulated components for double pipe systems are equipped with fixing plates. When such components are used, no further action need be taken with respect to fixing plates.

When component assemblies are used, fixing plates must be fitted concurrently with pipe installation.

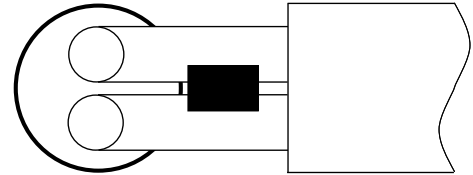
## Steel pipes – double – installation rules

7.1.2

Fixing plates must be used with the following component assemblies:

- The branch line of all branch assemblies
- Flexible joints
- Reducers - on the largest dimension
- End casings

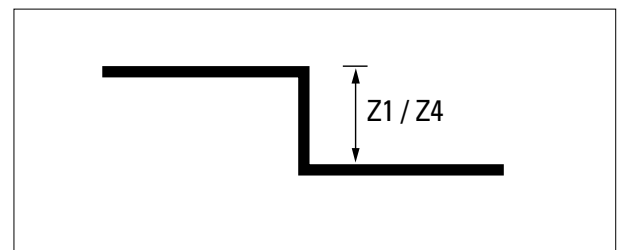
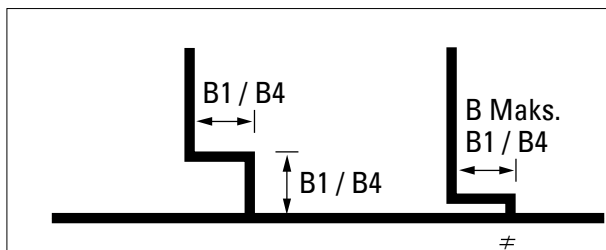
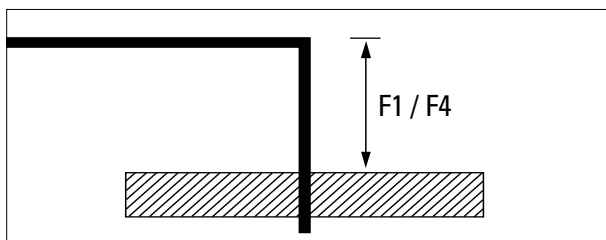
Fixing plates must always be installed at entries to basements.



### Direction changes / bends

All bends of between 80° and 90° can be used to absorb expansion and may be installed in the system with no further provisions.

Expansion offsets should be designed in accordance with the minimum dimensions given in the table below.



Steel pipe d outside mm	Installation methods 1 and 2			Installation method 4		
	B1 m	F1 m	Z1 m	B4 m	F4 m	Z4 m
26,9 + 26,9	0,9	0,9	1,1	1,0	1,0	1,3
33,7 + 33,7	1,1	1,1	1,4	1,3	1,3	1,6
42,4 + 42,4	1,2	1,3	1,5	1,4	1,5	1,7
48,3 + 48,3	1,4	1,5	1,7	1,6	1,8	2,0
60,3 + 60,3	1,6	1,8	2,0	1,9	2,1	2,3
76,1 + 76,1	1,9	2,5	2,3	2,2	3,0	2,7
88,9 + 88,9	2,1	3,0	2,6	2,3	3,3	3,0
114,3 + 114,3	2,3	3,8	3,0	2,8	4,2	3,5
139,7 + 139,7	2,8	4,5	3,5	3,2	5,1	4,0
168,3 + 168,3	3,2	5,3	4,0	3,7	6,2	4,6
219,1 + 219,1	4,0	6,5	5	4,5	7,5	5,5

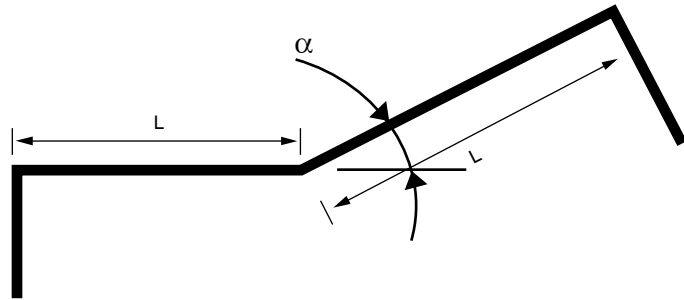
Max. lengths	
Jacket pipe branch d outside mm	Max. B parallel branches B Max. M
26,9	3,1
33,7	3,2
42,4	3,2
48,3	3,2
60,3	3,2
76,1	3,2
88,9	3,4
114,3	3,8
139,7	4,4
168,3	5,0
219,1	5,6

## Steel pipes – double – installation rules

### 7.1.3

Direction changes of less than 80° should be designed in accordance with the table below.

$\alpha$	Max. L as % of F
$\leq 5^\circ$	1 x F
15°	40%
25°	30%
35°	30%
45°	35%
55°	50%
65°	65%
75°	85%
$\geq 80^\circ$	2 x F



F-values are given in the table below.

Friction lengths (F) for double pipes are given in the table below.

Series 1				Series 2				Series 3			
d outside mm	F(m) Soil covering 0,6 m	F(m) Soil covering 0,8 m	F(m) Soil covering 1,0 m	d outside mm	F(m) Soil covering 0,6 m	F(m) Soil covering 0,8 m	F(m) Soil covering 1,0 m	d outside mm	F(m) Soil covering 0,6 m	F(m) Soil covering 0,8 m	F(m) Soil covering 1,0 m
26,9 + 26,9 / 125	36	27	22	26,9 + 26,9 / 140	33	25	20	26,9 + 26,9 / 160	29	22	18
33,7 + 33,7 / 140	51	39	31	33,7 + 33,7 / 160	44	34	27	33,7 + 33,7 / 180	39	30	24
42,4 + 42,4 / 160	56	43	35	42,4 + 42,4 / 180	50	38	31	42,4 + 42,4 / 200	45	34	28
48,3 + 48,3 / 160	64	49	39	48,3 + 48,3 / 180	57	43	35	48,3 + 48,3 / 200	51	39	31
60,3 + 60,3 / 200	63	48	39	60,3 + 60,3 / 225	56	43	35	60,3 + 60,3 / 250	50	38	31
76,1 + 76,1 / 225	70	54	43	76,1 + 76,1 / 250	63	48	39	76,1 + 76,1 / 280	56	43	35
88,9 + 88,9 / 250	72	55	45	88,9 + 88,9 / 280	64	49	40	88,9 + 88,9 / 315	57	44	36
114,3 + 114,3 / 315	80	62	50	114,3 + 114,3 / 355	71	55	45	114,3 + 114,3 / 400	62	48	39
139,7 + 139,7 / 400	74	57	47	139,7 + 139,7 / 450	65	51	42	139,7 + 139,7 / 500	58	45	37
168,3 + 168,3 / 450	85	67	55	168,3 + 168,3 / 500	76	60	49	168,3 + 168,3 / 560	67	53	43
219,1 + 219,1 / 560	94	74	61	219,1 + 219,1 / 630	83	66	54	219,1 + 219,1 / 710	73	58	48
273,0 + 273,0 / 710	97	77	64	273,0 + 273,0 / 800	85	68	56	273,0 + 273,0 / 900	74	59	49



## Steel pipes – double – installation rules

7.1.4

### Direction changes / curved pipes

Horizontal direction changes can be made by utilising the elastic bending radius of the steel pipes.

Values for the elastic bending radius of double steel pipes are given in the table below.

Steel pipe d outside mm	Horizontal 		Vertical* 	
	Min. elastic bending radius m	Max. elastic bending angle (per 12 m)	Min. elastic bending radius m	Max. elastic bending angle (per 12 m)
26,9 + 26,9	13	51,0°	73	13,0°
33,7 + 33,7	17	41,0°	86	11,0°
42,4 + 42,4	21	32,0°	104	8,8°
48,3 + 48,3	24	28,0°	116	7,9°
60,3 + 60,3	30	23,0°	141	6,5°
76,1 + 76,1	38	18,0°	172	5,3°
88,9 + 88,9	44	15,0°	203	4,5°
114,3 + 144,3	57	12,0°	254	3,6°
139,7 + 139,7	70	10,0°	309	3,0°
168,3 + 168,3	84	8,2°	377	2,4°
219,1 + 219,1	110	6,3°	483	1,9°

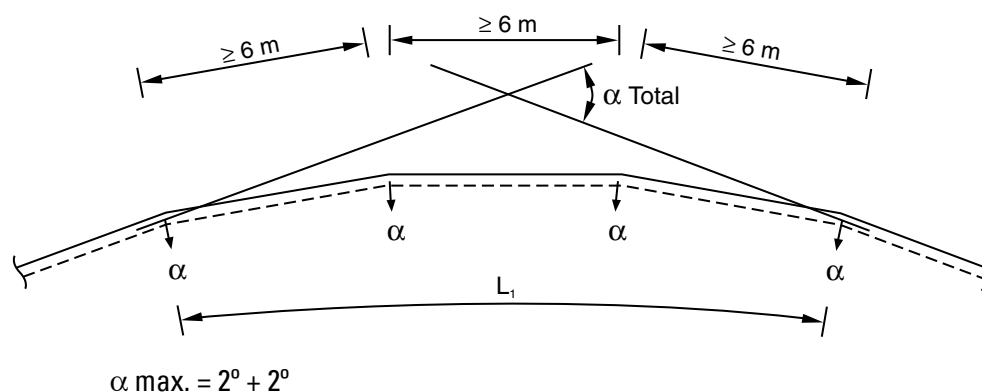
\*With all vertical bends, the pipe will try to twist.



If larger direction changes are required, pre-fabricated curved pipes must be used (see chapter 8). Elastic bends of double pipes require greater forces than similar bends of single pipes.

### Direction changes / bevelled joints

When installation methods 1 and 2 are used, the steel pipes may be connected by means of bevelled joints of max. 2° + 2° with 6 m between successive bevelled joints.

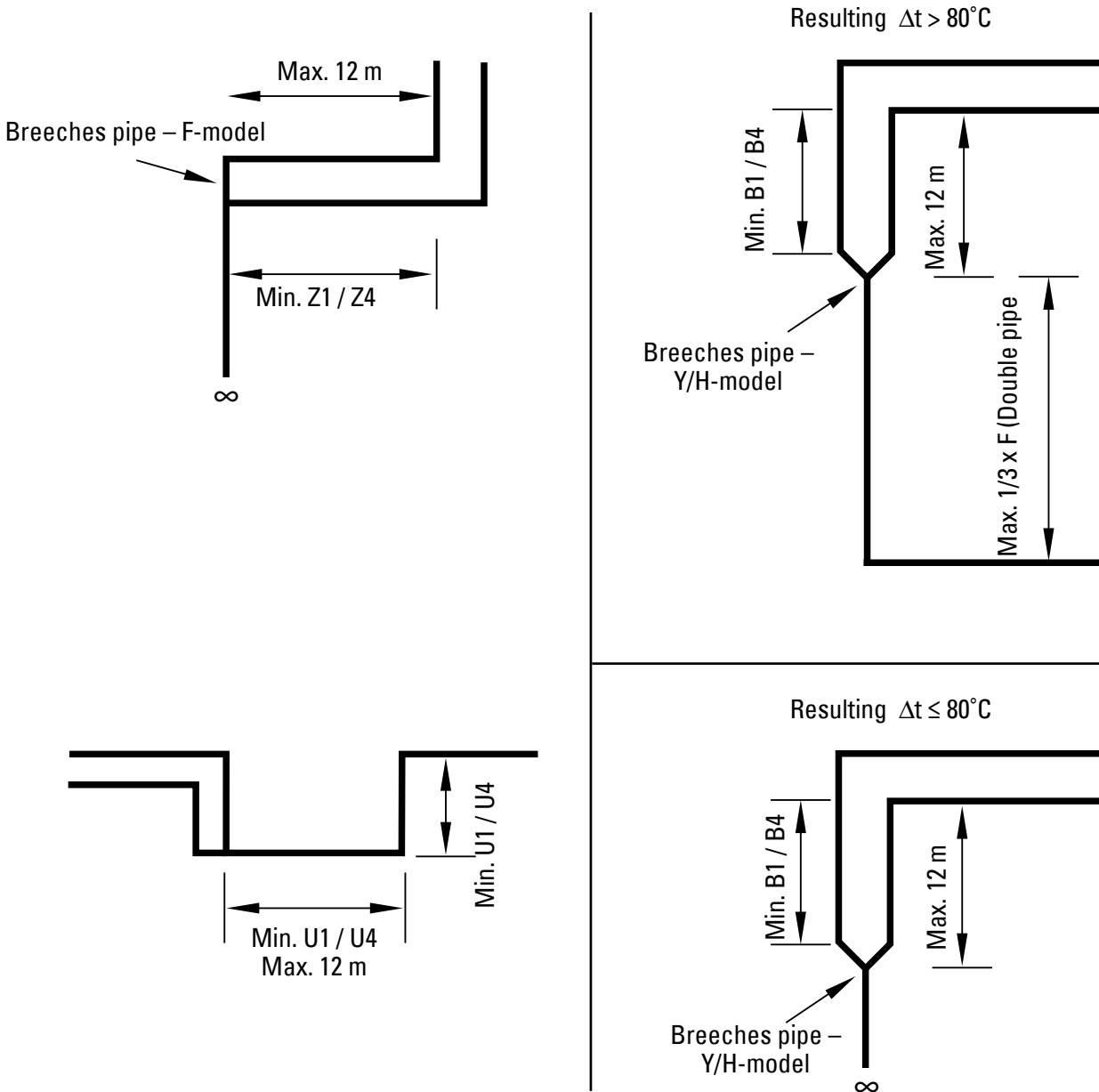


As a general rule, bevelled joints must be avoided when installation method 4 is used. For further information, please contact the isoplus technical department.

### Connecting double and single pipes

Double pipes are connected to single pipes using breeches pipes, either Y or F-models.

Stress in such joints must always be relieved by means of an expansion offset.



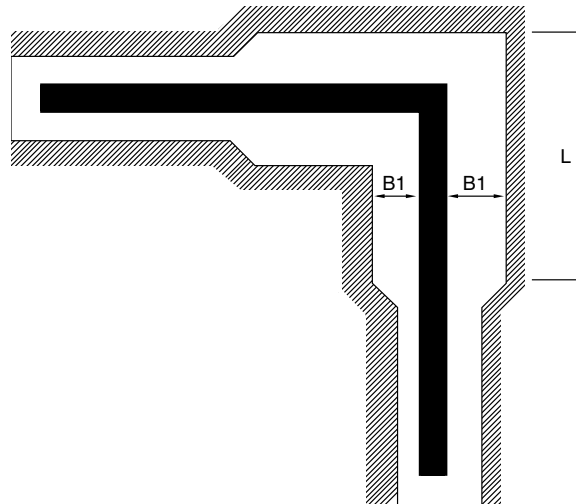
In general, all B - Z or U measurements are for single pipes.

## Steel pipes – double – installation rules

### 7.1.6

#### Expansion absorption

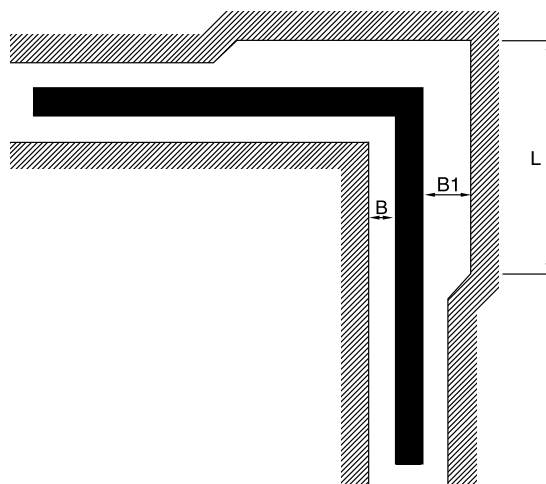
When installation method 2 is used, expansion at branches and bends must be absorbed in expansion zones of sand (see table).



Steel pipe	Width of sand in expansion zone	Expansion zone length
d outside mm	Jacket pipe to trench wall B1 mm	L m
26,9 + 26,9	100	0,8
33,7 + 33,7	100	0,8
42,4 + 42,4	100	1,0
48,3 + 48,3	100	1,0
60,3 + 60,3	140	1,1
76,1 + 76,1	140	1,2
88,9 + 88,9	190	1,4
114,3 + 114,3	190	1,7
139,7 + 139,7	240	1,9
168,3 + 168,3	240	2,1
219,1 + 219,1	300	3,5

## Expansion absorption

When installation methods 1 and 4 are used, expansion at branches and bends must be absorbed in expansion zones of sand (see table).



Steel pipe	Width of sand in expansion zone		Expansion zone length
	Jacket pipe to trench wall B mm	Jacket pipe to trench wall B1 mm	L m
d outside mm			
26,9 + 26,9	100	140	0,9
33,7 + 33,7	100	140	0,9
42,4 + 42,4	100	140	1,1
48,3 + 48,3	100	190	1,1
60,3 + 60,3	140	190	1,2
76,1 + 76,1	140	190	1,3
88,9 + 88,9	140	240	1,5
114,3 + 114,3	140	285	1,8
139,7 + 139,7	190	330	2,0
168,3 + 168,3	190	330	2,2
219,1 + 219,1	240	430	3



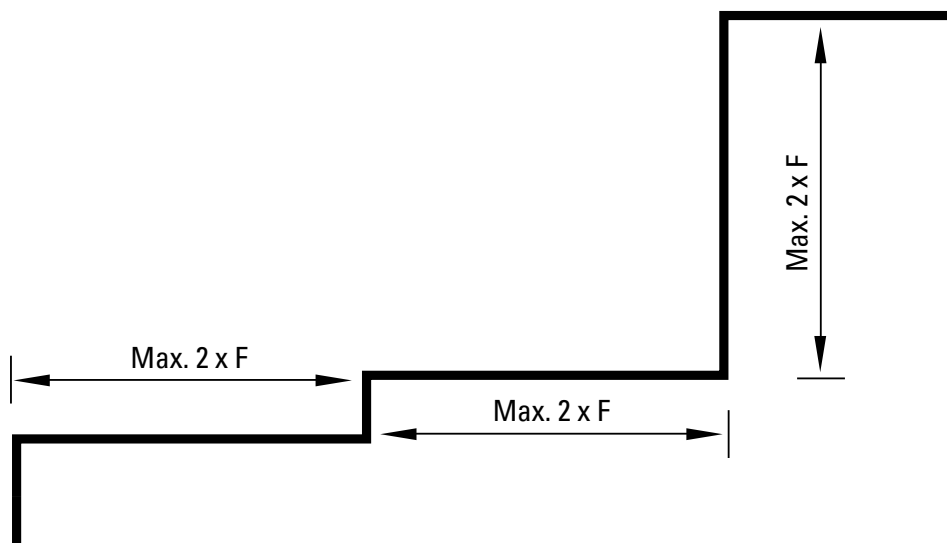
## Installation method 1 – Expansion bends

7.2

### Straight runs

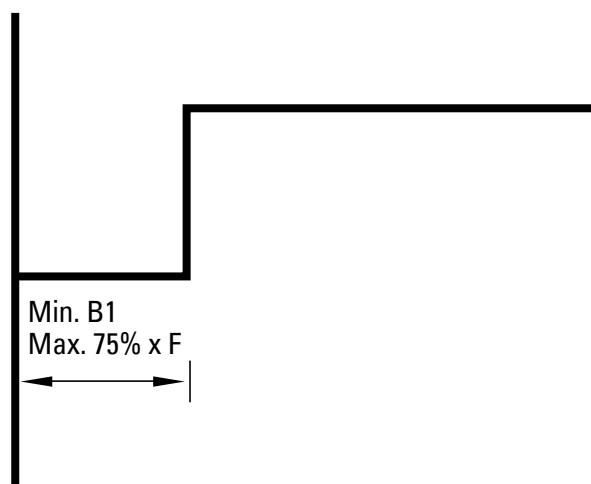
In practice, expansion bends are only used where expansion offsets are required ahead of building entries or where bends occur naturally in the pipeline.

As long as the distance between two 80-90° bends is less than twice the friction length ( $2xF$ ) stated in the friction length table, the system can be installed using installation method 1.



### Branches

On branch lines, the distance between the branch and the first expansion offset must never exceed 75% of the friction length ( $F$ ).



### Expansion offsets

When installation method 1 is used, expansion offsets must be designed in accordance with the table for expansion offsets, see catalogue section 7.

### Reducers

When installation method 1 is used, reducers with two diameter steps can be installed in the system.

If a reduction of more than two diameter steps is required, please contact the isoplus technical department.

When installation method 1 is used, reducers must be equipped with fixing plates on the large diameter side, see catalogue section 7.1.2.

The distance between successive reducers must never be less than 18 m.

For further information on installation method 1, see catalogue section 4.

## **Heat prestressing**

In installation method 2, the pipeline is heated to the preheating temperature before the trench is backfilled.

The required preheating temperature should be calculated as the average of the installation temperature and the max. operating temperature.

## **Branches**

When installation method 2 is used, there is no limit to the length of branch lines.

## **Expansion offsets**

When installation method 2 is used, expansion offsets must be designed in accordance with the table for expansion offsets.

## **Reducers**

When installation method 2 is used, reducers with two diameter steps can be installed in the system.

If a reduction of more than two diameter steps is required, please contact the isoplus technical department.

When installation method 2 is used, reducers must be equipped with fixing plates on the large diameter side, see catalogue section 7.

The distance between successive reducers must never be less than 18 m.

For further information on installation method 2, see catalogue section 4.

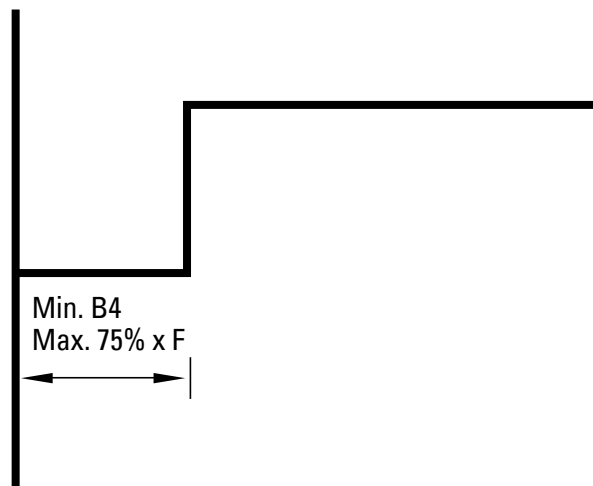
### Cold installation

Cold installation is used where axial stresses in the steel pipes greater than 180 N/mm<sup>2</sup> are acceptable. Cold installation is particularly suitable for transmission pipelines.

Cold installed systems (installation method 4) with a resulting  $\Delta t$  of max 80°C should be installed in accordance with the rules applicable for heat prestressing (installation method 2).

### Branches

On branch lines, the distance between the branch and the first expansion offset must never exceed 75% of the friction length (F).



When installation method 4 is used, any branches located further from an expansion bend than the friction length (F) must be strengthened using reinforcement plates.

All isoplus pre-insulated branches can be considered as factory reinforced.

### Expansion offsets

When installation method 4 is used, expansion offsets must be designed in accordance with the table for expansion offsets, see catalogue section 7.

## Installation method 4 – Cold installation

7.4.1

### Reducers

Reducers must never have more than one diameter step.

If a reduction of more than one diameter step is required, please contact the isoplus technical department.

When installation method 4 is used, reducers must be equipped with fixing plates on the large diameter side, see catalogue section 7.

The distance between successive reducers must never be less than 18 m.

For further information on installation method 4, see catalogue section 4.

### Direction changes

As a general rule, bevelled joints should be avoided when installation method 4 is used. For further information, please contact the isoplus technical department.