PP-R SYSTEM

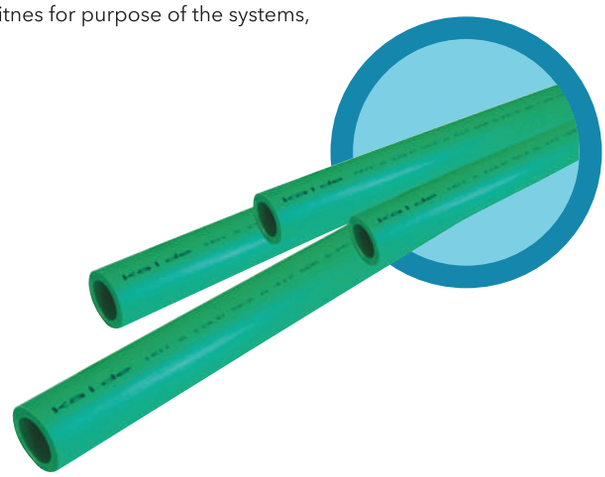
kalde®

First Choice

Kalde PP-r Tubes and Fittings for Hot & Cold Water and Heating Installation Systems

• Applied Norms

DIN 8077	Polypropylene (PP) pipes' dimensions
DIN 8078	Polypropylene (PP) pipes' general quality requirements and testing
DIN 16962 (6-9)	Pipe joints and elements for polypropylene (PP) pressure pipelines, types 1 and 2; injection moulded elbows for socket-welding, dimensions
DIN 16962	Pipe joints and components of polypropylene (PP) for pipes under pressure, - Part 5: General quality requirements, testing
DIN 1988	Drinking water line installation
DIN 4109	Sound insulation in building construction
DVS 2207 (11)	Welding regulations for plastic pipes
DVS 2208.1	Machines and devices for welding thermoplastic pipes
DIN 10226-1	Pipe threads where pressure tight joints are made on the thereads – Part 1: Taper external threads and paralel internal threads - Dimension, tolerances and designation
DIN 16928	Pipe connections and components - Pipes of thermoplastic materials; pipe joints, elements for pipes, laying; general directions
EN ISO 15874	Plastics piping systems for hot and cold water installations – polypropylene; Part 1: General, Part 2: Pipe, Part 3: Fittings, Part 5: Fitnes for purpose of the systems, Part 7: Guidance for the assessment of conformity



• Raw Material: Polypropylene Random Copolimer (PP-r)

Polypropylene Random Copolimer (PP-r) is widely used in hot water, floor- and radiator heating systems as well as in industrial liquid distribution systems. Most commonly, this material can be found in drinking water installations.

Kalde pipes are produced using solely PP-r. PP-r has several advantages over other materials: long duration, better flexibility, high resistance to pressure and heat, high molecular weight, low MFR, high acoustic and thermal insulation.

PP-r is suitable for DIN 8078 and EN ISO 15874-1 standards.

The metal inserts used in the polypropylene fittings increase the reliability of the products. Kalde's experience in brass fittings for more than 35 years results in high quality fittings with very reliable metal inserts.

Physical and Thermal Properties

Properties	Testing Methods	Unit	Values
Density, at 23 °C	ISO 1183	g/cm^3	0,9
Melt flow index (MFI) 230 °C/2, 16 kg	ISO 1133	g/10 min	0,3
Thermal conductivity at 23 °C	DIN 52612-1	W/m.K	0,23
Coefficient of linear expansion K^{-1} average between 0 °C up to 110 °C	DIN 53712	K^{-1}	$1,5 \times 10^{-4}$
Surface Resistance (ohm)	DIN IEC 60093	Ω	$>10^{12}$
Deflection temperature under load 1,8 N/mm^2 0,45 N/mm^2	 ISO 75A-1, -2 ISO 75B-1, -2	 °C °C	 49 70
VICAT softening point (1 kg) (5 kg)	ASTM D 1525 ISO 306 DIN 53460	 °C °C	 130 70
Melting point	DSC	°C	146
OIT (oxydation induction time 200 °C)	EN 728	(≥20)	>25

Mechanical Properties

Properties	Testing Methods	Unit	Values
Tensile stres at yield (23 °C) At 50 mm/min	ISO 527-1,-2	N/mm^2	24
Tensile strain at yield At 50 mm/min		%	10
Flexural modulus at 23 °C	ISO 527	N/mm^2	800
Charpy impact strength (notched) at 23 °C at 0 °C	ISO 179/1eA	 kJ/m^2 kJ/m^2	 22 4,5
Charpy impact strength (unnotched) (0 C°)	ISO 179	Joule	No break
Hardness (shore D)	ISO 868		60

• Thermal Expansion in PP-r Tubes

The polypropylene pipes have an expansion coefficient that is much higher than the metal pipes. It is critical to take this characteristic into consideration during installations.

Calculation of thermal expansion is as follows: $\Delta L = L * \Delta T * \lambda$

where

ΔT = The difference between environmental temperature and water temperature in Kelvin degrees (K) or Celsius (°C).

ΔL = Variation of length in mm.

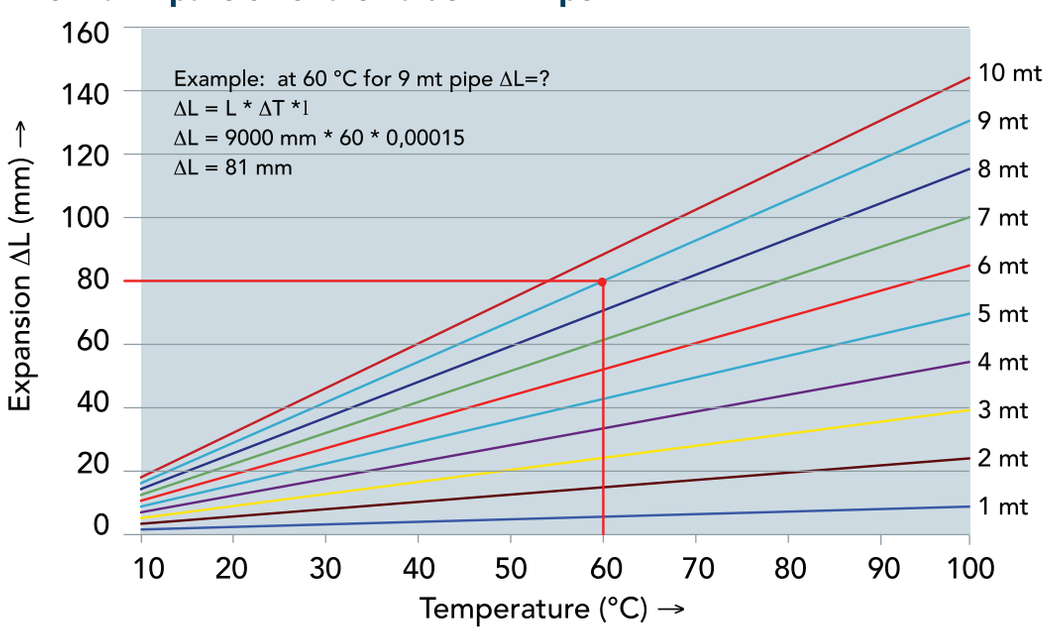
L = Initial length of the pipe in m.

λ = Coefficient of linear thermal expansion. The value of λ is $1,5 * 10^{-4}$ (K^{-1}) for PP-r tubes.

Pipe length (M)	Temperature variation ΔT in K									
	1	5	10	20	30	40	50	60	70	80
	Linear expansion ΔL (mm)									
1.0	0.15	0.75	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00
2.0	0.30	1.50	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00
3.0	0.45	2.25	4.50	9.00	13.50	18.00	22.50	27.00	31.50	36.00
4.0	0.60	3.00	6.00	12.00	18.00	24.00	30.00	36.00	42.00	48.00
5.0	0.75	3.75	7.50	15.00	22.50	30.00	37.50	45.00	52.50	60.00
6.0	0.90	4.50	9.00	18.00	27.00	36.00	45.00	54.00	63.00	72.00
7.0	1.05	5.25	10.50	21.00	31.50	42.00	52.50	63.00	73.50	84.00
8.0	1.20	6.00	12.00	24.00	36.00	48.00	60.00	72.00	84.00	96.00
9.0	1.35	6.75	13.50	27.00	40.50	54.00	67.50	81.00	94.50	108.00
10.0	1.50	7.50	15.00	30.00	45.00	60.00	75.00	90.00	105.00	120.00

Note: When the water temperature circulating in the pipe is higher than the environmental temperature, the result will be an elongation. But if the water temperature circulating in the pipe is lower than the environmental temperature, the result will be a shortage.

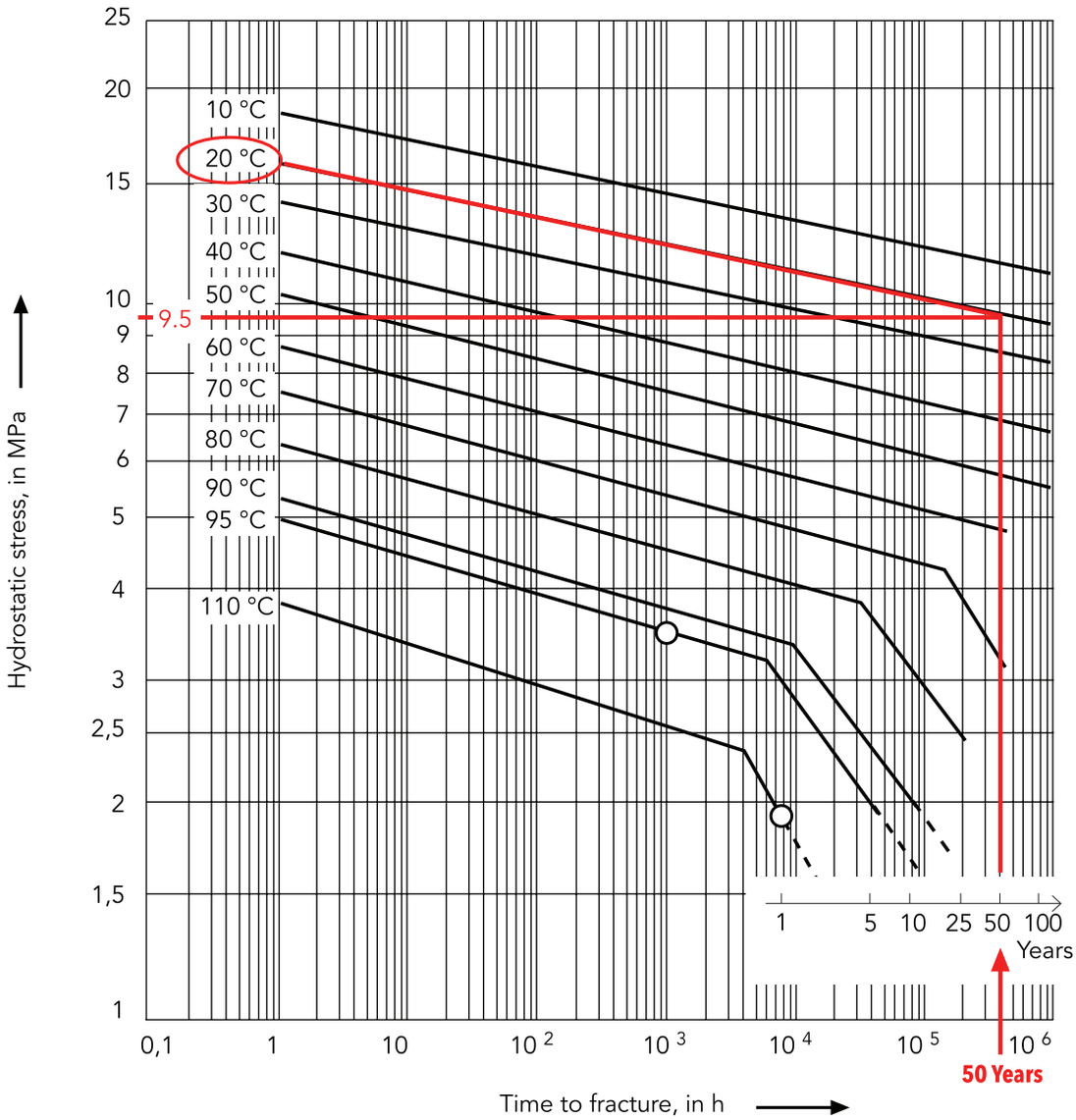
Thermal Expansion of the Kalde PP-r Pipe



• Operating Life According to DIN 8077 (SF=1.5 PP-r 80)

Temperature °C	Operation Life (Year)	Series (S)							
		20	16	12,5	8,3	5	3,2	2,5	2
		Standard Dimention Rate (SDR)							
		41 PN2,5	33 PN3,2	26 PN4	17,6 PN6	11 PN10	7,4 PN16	6 PN20	5 PN25
		Pressure (bar)							
20	1	3,7	4,7	5,9	9,0	15,0	23,7	29,9	37,7
	5	3,5	4,4	5,6	8,4	14,1	22,3	28,1	35,4
	10	3,4	4,3	5,4	8,2	13,7	21,7	27,4	34,5
	25	3,3	4,1	5,2	7,9	13,2	21,0	26,4	33,3
	50	3,2	4,0	5,1	7,7	12,9	20,4	25,7	32,4
	100	3,1	3,9	5,0	7,5	12,5	19,9	25,0	31,5
30	1	3,2	4,0	5,0	7,6	12,7	20,2	25,4	32,0
	5	3,0	3,7	4,7	7,2	11,9	18,9	23,8	30,0
	10	2,9	3,6	4,6	7,0	11,6	18,4	23,2	29,2
	25	2,8	3,5	4,4	6,7	11,2	17,7	22,3	28,1
	50	2,7	3,4	4,3	6,5	10,9	17,2	21,7	27,4
	100	2,6	3,3	4,2	6,3	10,6	16,8	21,1	26,6
40	1	2,7	3,4	4,3	6,5	10,8	17,1	21,6	27,2
	5	2,5	3,2	4,0	6,0	10,1	16,0	20,2	25,4
	10	2,4	3,1	3,9	5,9	9,8	15,5	19,6	24,7
	25	2,3	2,9	3,7	5,6	9,4	15,0	18,8	23,7
	50	2,3	2,9	3,6	5,5	9,2	14,5	18,3	23,1
	100	2,2	2,8	3,5	5,3	8,9	14,1	17,8	22,4
50	1	2,3	2,8	3,6	5,5	9,1	14,5	18,2	23,0
	5	2,1	2,7	3,4	5,1	8,5	13,5	17,0	21,4
	10	2,0	2,6	3,3	4,9	8,2	13,1	16,5	20,8
	25	2,0	2,5	3,1	4,7	7,9	12,6	15,9	20,0
	50	1,9	2,4	3,0	4,6	7,7	12,2	15,4	19,4
	100	1,8	2,3	2,9	4,5	7,5	11,8	14,9	18,8
60	1	1,9	2,4	3,0	4,6	7,7	12,2	15,4	19,4
	5	1,8	2,2	2,8	4,3	7,1	11,3	14,3	18,0
	10	1,7	2,2	2,7	4,1	6,9	11,0	13,9	17,5
	25	1,6	2,1	2,6	4,0	6,6	10,5	13,3	16,7
	50	1,6	2,0	2,5	3,8	6,4	10,2	12,9	16,2
70	1	1,6	2,0	2,5	3,9	6,5	10,3	12,9	16,3
	5	1,5	1,9	2,4	3,6	6,0	9,5	12,0	15,1
	10	1,4	1,8	2,3	3,5	5,8	9,2	11,6	14,6
	25	1,2	1,5	2,0	3,0	5,0	8,0	10,0	12,7
	50	1,0	1,3	1,7	2,5	4,2	6,7	8,5	10,7
80	1	1,3	1,7	2,1	3,2	5,4	8,6	10,8	13,7
	5	1,2	1,5	1,9	2,9	4,8	7,6	9,6	12,1
	10	1,0	1,2	1,6	2,4	4,0	6,4	8,1	10,2
	25	0,8	1,0	1,2	1,9	3,2	5,1	6,5	8,1
95	1	0,9	1,2	1,5	2,3	3,8	6,1	7,6	9,6
	5	0,6	0,8	1,0	1,5	2,6	4,1	5,2	6,5
	(10)1	(0,5)	(0,6)	(0,8)	(1,3)	(2,2)	(3,4)	(4,3)	(5,5)

• Hydrostatic Pressure Performance



Hydrostatic pressure is calculated according to the below formula:

$$P = \frac{2 * e_{min} * s}{d_e - e_{min}}$$

P = Internal pressure, MPa.
d_e = Outside diameter of the pipe, mm.
e_{min} = Minimum wall thickness of the pipe, mm.
s = Hydrostatic stress, MPa.
1MPa = 10 bar = 14.5 Psi.

• Thermal Expansion in Polypropylene Pipes with Fiberglass

Polypropylene pipes with fiberglass have an expansion coefficient that is much higher than metal pipes. It is critical to take this characteristic into consideration during installations.

Calculation of thermal expansion is as follows: $\Delta L = L * \Delta T * \lambda$

where

ΔT = The difference between environmental temperature and water temperature in Kelvin degrees (K) or Celsius (°C).

ΔL = Variation of length in mm.

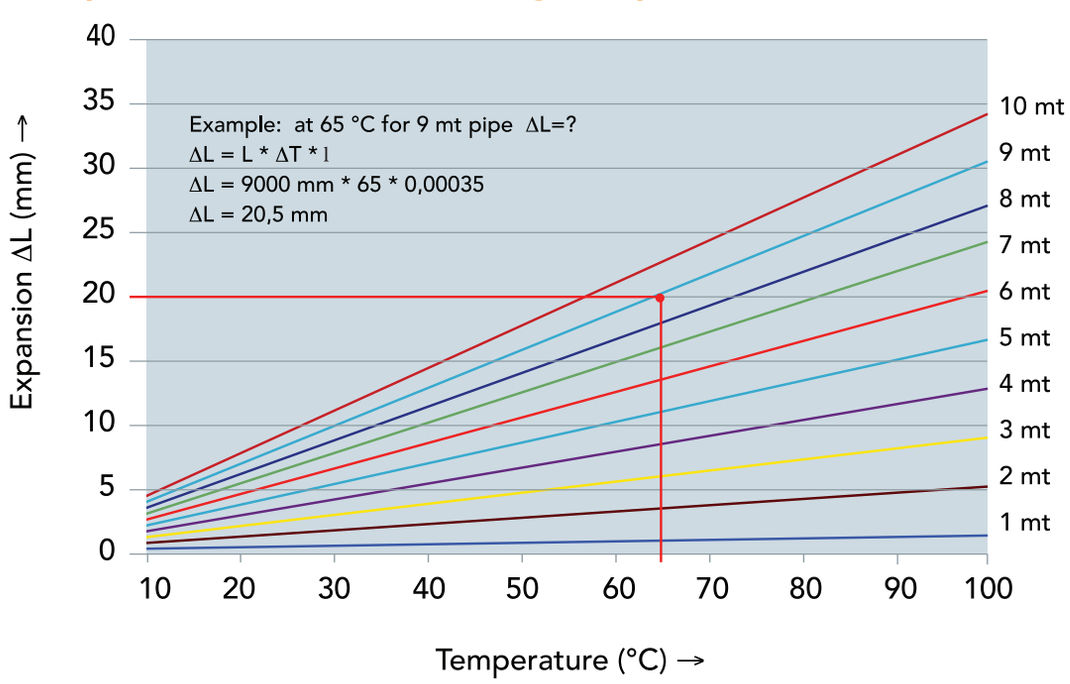
L = Initial length of the pipe in m.

λ = Coefficient of linear thermal expansion. The value of λ is $0.35 * 10^{-4}$ (K^{-1}) for fiber pipes.

Pipe length (m)	Temperature variation ΔT in K									
	1	5	10	20	30	40	50	60	70	80
	Linear expansion ΔL (mm)									
1.0	0,035	0,17	0,35	0,70	1,05	1,40	1,75	2,10	2,45	2,80
2.0	0,070	0,35	0,70	1,40	2,10	2,80	3,50	4,20	4,90	5,60
3.0	0,105	0,52	1,05	2,10	3,15	4,20	5,25	6,30	7,35	8,40
4.0	0,140	0,70	1,40	2,80	4,20	5,60	7,00	8,40	9,80	11,20
5.0	0,175	0,87	1,75	3,50	5,25	7,00	8,75	10,50	12,25	14,00
6.0	0,210	1,05	2,10	4,20	6,30	8,40	10,50	12,60	14,70	16,80
7.0	0,245	1,22	2,45	4,90	7,35	9,80	12,25	14,70	17,15	19,60
8.0	0,280	1,40	2,80	5,60	8,40	11,20	14,00	16,80	19,60	22,40
9.0	0,315	1,57	3,15	6,30	9,45	12,60	15,75	18,90	22,05	25,20
10.0	0,350	1,75	3,50	7,00	10,50	14,00	17,50	21,00	24,50	28,00

Note: When the water temperature circulating in the pipe is higher than the environmental temperature, the result will be an elongation. But if the water temperature circulating in the pipe is lower than the environmental temperature, the result will be a shortage.

Thermal Expansion of the Kalde PP-r Fiber-glass Pipe



• Support Intervals

Kalde PP-r Pipe SDR:6 - SDR:7.4 (PN20 - PN16)

Temperature ΔT (K)	Pipe diameter d (mm)								
	20	25	32	40	50	63	75	90	110
	Support intervals in cm								
20	60	70	90	100	120	140	150	160	180
30	60	70	90	100	120	140	150	160	180
40	60	70	80	90	110	130	140	150	170
50	60	70	80	90	110	130	140	150	170
60	50	60	70	80	100	110	120	140	160
70	50	60	70	80	90	100	110	120	140

Kalde PP-r Pipe SDR:11 (PN10) (Temperature of Medium:20°C)

Temperature ΔT (K)	Pipe diameter d (mm)								
	20	25	32	40	50	63	75	90	110
	Support intervals in cm								
20	60	70	90	100	120	140	150	160	180

Kalde Foil Pipe SDR:6 - SDR:7.4 (PN25 - PN20)

Temperature ΔT (K)	Pipe diameter d (mm)								
	20	25	32	40	50	63	75	90	110
	Support intervals in cm								
20	110	120	140	160	180	200	210	220	240
30	110	120	140	160	180	200	210	220	230
40	110	120	130	150	170	190	200	210	220
50	110	120	130	150	170	190	200	210	210
60	100	110	120	140	160	180	190	200	200
70	90	100	110	130	150	170	180	190	200

Kalde Fiberglas Pipe SDR:6 - SDR:7.4 (PN25 - PN20)

Temperature ΔT	Pipe diameter d (mm)								
	20	25	32	40	50	63	75	90	110
	Support intervals in cm								
20	90	100	110	120	140	160	170	180	200
30	90	100	110	120	140	160	170	180	200
40	80	90	100	110	130	150	160	170	180
50	80	90	100	110	130	150	160	170	180
60	70	80	90	100	120	140	150	160	170
70	70	80	90	100	120	120	140	150	160

• Pressure Losses

Dimension of Pipes (out diameter x wall thickness), mm										
		20x3,4	25x4,2	32x5,4	40x6,7	50x8,3	63x10,5	75x12,5	90x15,0	110x18,3
	d1, mm	13,2	16,6	21,2	26,6	33,4	42	50	60	73,4
Q	A, m^2	0,137	0,216	0,353	0,555	0,876	1,385	1,962	2,826	4,229
0,01	ΔPd	0,00055	0,00028	0,00013	0,00007	0,00003	0,00002	0,00001	0,00001	0,00000
	V	0,07299	0,04630	0,02833	0,01802	0,01142	0,00722	0,00510	0,00354	0,00236
0,05	ΔPd	0,00276	0,00139	0,00067	0,00034	0,00017	0,00009	0,00005	0,00003	0,00002
	V	0,36496	0,23148	0,14164	0,09009	0,05708	0,03610	0,02548	0,01769	0,01182
0,1	ΔPd	0,00553	0,00279	0,00134	0,00068	0,00034	0,00017	0,00010	0,00006	0,00003
	V	0,72993	0,46296	0,28329	0,18018	0,11416	0,07220	0,05097	0,03539	0,02365
0,2	ΔPd	0,01106	0,00558	0,00267	0,00135	0,00068	0,00034	0,00020	0,00012	0,00006
	V	1,45985	0,92593	0,56657	0,36036	0,22831	0,14440	0,10194	0,07077	0,04729
0,5	ΔPd	0,02765	0,01394	0,00668	0,00339	0,00171	0,00086	0,00051	0,00029	0,00016
	V	3,64964	2,31481	1,41643	0,90090	0,57078	0,36101	0,25484	0,17693	0,11823
1	ΔPd	0,05530	0,02789	0,01336	0,00677	0,00342	0,00172	0,00102	0,00059	0,00032
	V	7,29927	4,62963	2,83286	1,80180	1,14155	0,72202	0,50968	0,35386	0,23646
1,5	ΔPd	0,08295	0,04183	0,02004	0,01016	0,00513	0,00258	0,00153	0,00088	0,00048
	V	10,94891	6,94444	4,24929	2,70270	1,71233	1,08303	0,76453	0,53079	0,35469
2	ΔPd	0,11060	0,05578	0,02673	0,01355	0,00684	0,00344	0,00204	0,00118	0,00064
	V	14,59854	9,25926	5,66572	3,60360	2,28311	1,44404	1,01937	0,70771	0,47293
2,5	ΔPd	0,13824	0,06972	0,03341	0,01693	0,00854	0,00430	0,00255	0,00147	0,00081
	V	18,24818	11,57407	7,08215	4,50450	2,85388	1,80505	1,27421	0,88464	0,59116
3	ΔPd	0,16589	0,08367	0,04009	0,02032	0,01025	0,00516	0,00306	0,00177	0,00097
	V	21,89781	13,88889	8,49858	5,40541	3,42466	2,16606	1,52905	1,06157	0,70939
3,5	ΔPd	0,19354	0,09761	0,04677	0,02371	0,01196	0,00602	0,00357	0,00206	0,00113
	V	25,54745	16,20370	9,91501	6,30631	3,99543	2,52708	1,78389	1,23850	0,82762
4	ΔPd	0,22119	0,11156	0,00296	0,00150	0,00076	0,00001	0,00000	0,00000	0,00000
	V	29,19708	18,51852	0,62660	0,39854	0,25250	0,00213	0,00039	0,00027	0,00000
4,5	ΔPd	0,24884	0,12550	0,06013	0,03048	0,01538	0,00774	0,00459	0,00265	0,00145
	V	32,84672	20,83333	12,74788	8,10811	5,13699	3,24910	2,29358	1,59236	1,06408
5	ΔPd	0,02595	0,03253	0,04163	0,05216	0,06557	0,08244	0,09810	0,11775	0,14404
	V	3,42500	5,40000	8,82500	13,87500	21,90000	34,62500	49,05000	70,65000	105,72500
5,5	ΔPd	0,01142	0,01431	0,01832	0,02295	0,02885	0,03627	0,04316	0,05181	0,06338
	V	1,50700	2,37600	3,88300	6,10500	9,63600	15,23500	21,58200	31,08600	46,51900
6	ΔPd	0,33179	0,16734	0,08018	0,04064	0,02051	0,01031	0,00612	0,00354	0,00193
	V	43,79562	27,77778	16,99717	10,81081	6,84932	4,33213	3,05810	2,12314	1,41878
6,5	ΔPd	0,35943	0,18128	0,08686	0,04403	0,02222	0,01117	0,00663	0,00383	0,00209
	V	47,44526	30,09259	18,41360	11,71171	7,42009	4,69314	3,31295	2,30007	1,53701
7	ΔPd	0,38708	0,19523	0,09354	0,04742	0,02392	0,01203	0,00714	0,00413	0,00226
	V	51,09489	32,40741	19,83003	12,61261	7,99087	5,05415	3,56779	2,47700	1,65524
7,5	ΔPd	0,41473	0,20917	0,10022	0,05080	0,02563	0,01289	0,00765	0,00442	0,00242
	V	54,74453	34,72222	21,24646	13,51351	8,56164	5,41516	3,82263	2,65393	1,77347
8	ΔPd	0,44238	0,22311	0,10690	0,05419	0,02734	0,01375	0,00815	0,00472	0,00258
	V	58,39416	37,03704	22,66289	14,41441	9,13242	5,77617	4,07747	2,83086	1,89170
9	ΔPd	0,49768	0,25100	0,12026	0,06096	0,03076	0,01547	0,00917	0,00531	0,00290
	V	65,69343	41,66667	25,49575	16,21622	10,27397	6,49819	4,58716	3,18471	2,12816
10	ΔPd	0,55298	0,27889	0,13363	0,06774	0,03418	0,01719	0,01019	0,00590	0,00322
	V	72,99270	46,29630	28,32861	18,01802	11,41553	7,22022	5,09684	3,53857	2,36463

• Pressure Loss in Straight Pipes:

The d'arcy formula is used to calculate the pressure loss in the pipes

$\Delta Pd = (\partial\, L/d1)(p.v/2) * 10^{-5}$ (bar)

ΔPd= pipe pressure loss (bar)

∂ = Pipe friction coefficient (for most cases 0,02)

D= outside diameter of pipe (m)

L = Length of pipe (m)

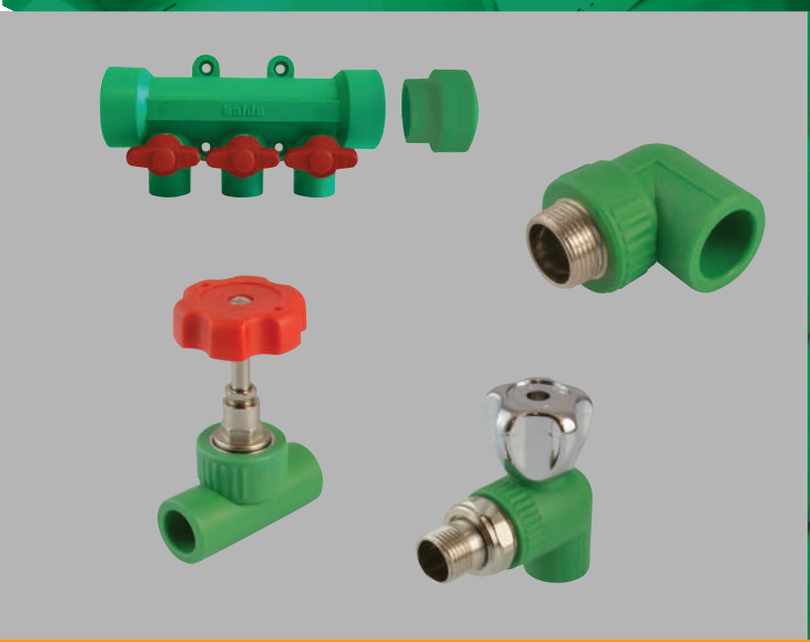
d1= Inside diameter of pipe (m)

p = Fluid density (kg/m3)

V= Flow velocity (m/s)

S= wall thickness (mm)

q= Flow rate (L/S)



PP-r Products

Polypropylene Tubes

PN-16 Polypropylene Tube

Code	D (mm)	m/bundle
3201-tbe-200016	20	100
3201-tbe-250016	25	80
3201-tbe-320016	32	40
3201-tbe-400016	40	32
3201-tbe-500016	50	20
3201-tbe-630016	63	16
3201-tbe-750016	75	12
3201-tbe-900016	90	8
3201-tbe-110016	110	4
3201-tbe-125016	125	1
3201-tbe-160016	160	1

PN-20 Polypropylene Tube

Code	D (mm)	m/bundle
3201-tbe-200000	20	100
3201-tbe-250000	25	80
3201-tbe-320000	32	40
3201-tbe-400000	40	32
3201-tbe-500000	50	20
3201-tbe-630000	63	16
3201-tbe-750000	75	12
3201-tbe-900000	90	8
3201-tbe-110000	110	4
3201-tbe-125000	125	1
3201-tbe-160000	160	1

PN-20 Polypropylene Tube with Fiberglass - Orangepipe

Code	D (mm)	m/bundle
3201-tfr-200020	20	100
3201-tfr-250020	25	80
3201-tfr-320020	32	40
3201-tfr-400020	40	32
3201-tfr-500020	50	20
3201-tfr-630020	63	16
3201-tfr-750020	75	12
3201-tfr-900020	90	8
3201-tfr-110020	110	4
3201-tfr-125020	125	1
3201-tfr-160020	160	1

**Our several pipes could be produced on demand also with ultraviolet resistance black layer.*

Polypropylene Tubes

PN-25 Polypropylene Tube with Fiberglass - Orangepipe

Code	D (mm)	m/bundle
3201-tfr-200000	20	100
3201-tfr-250000	25	80
3201-tfr-320000	32	40
3201-tfr-400000	40	32
3201-tfr-500000	50	20
3201-tfr-630000	63	16
3201-tfr-750000	75	12
3201-tfr-900000	90	8
3201-tfr-110000	110	4
3201-tfr-125000	125	1
3201-tfr-160000	160	1

PN-25 Polypropylene Tube - Supperpipe

Code	D (mm)	m/bundle
3201-tmf-200000	20	100
3201-tmf-250000	25	80
3201-tmf-320000	32	40
3201-tmf-400000	40	32
3201-tmf-500000	50	20
3201-tmf-630000	63	16
3201-tmf-750000	75	12
3201-tmf-900000	90	8

PP C - Bridge

Code	D (mm)	Pcs/Box
3201-twc-200001	20	250
3201-twc-250001	25	125
3201-twc-320001	32	60

**Our several pipes could be produced on demand also with ultraviolet resistance black layer.*

Elbow 45°

Code	Size	Pcs/Box
3211-elb-200045	20	500
3211-elb-250045	25	300
3211-elb-320045	32	175
3211-elb-400045	40	90
3211-elb-500045	50	50
3211-elb-630045	63	25
3211-elb-750045	75	12
3211-elb-900045	90	12
3211-elb-110045	110	6

Elbow 90°

Code	Size	Pcs/Box
3211-elb-200000	20	500
3211-elb-250000	25	300
3211-elb-320000	32	140
3211-elb-400000	40	70
3211-elb-500000	50	36
3211-elb-630000	63	20
3211-elb-750000	75	16
3211-elb-900000	90	6
3211-elb-110000	110	4

Tee

Code	Size	Pcs/Box
3211-teo-200000	20	300
3211-teo-250000	25	200
3211-teo-320000	32	100
3211-teo-400000	40	50
3211-teo-500000	50	30
3211-teo-630000	63	16
3211-teo-750000	75	12
3211-teo-900000	90	4
3211-teo-110000	110	2

Inegal Tee

Code	Size	Pcs/Box
3211-tio-202520	20 x 25 x 20	200
3211-tio-252020	25 x 20 x 20	200
3211-tio-252025	25 x 20 x 25	240
3211-tio-252520	25 x 25 x 20	200
3211-tio-253225	25 x 32 x 25	110
3211-tio-322020	32 x 20 x 20	130
3211-tio-322025	32 x 20 x 25	125
3211-tio-322032	32 x 20 x 32	115
3211-tio-322520	32 x 25 x 20	125
3211-tio-322525	32 x 25 x 25	120
3211-tio-322532	32 x 25 x 32	115
3211-tio-323225	32 x 32 x 25	100
3211-tio-402040	40 x 20 x 40	75
3211-tio-402540	40 x 25 x 40	75
3211-tio-403240	40 x 32 x 40	60
3211-tio-502050	50 x 20 x 50	40
3211-tio-502550	50 x 25 x 50	40
3211-tio-503250	50 x 32 x 50	30
3211-tio-504050	50 x 40 x 50	30
3211-tio-632063	63 x 20 x 63	24
3211-tio-632563	63 x 25 x 63	24
3211-tio-633263	63 x 32 x 63	24
3211-tio-634063	63 x 40 x 63	20
3211-tio-635063	63 x 50 x 63	20
3211-tio-752075	75 x 20 x 75	12
3211-tio-752575	75 x 25 x 75	12
3211-tio-753275	75 x 32 x 75	12
3211-tio-754075	75 x 40 x 75	12
3211-tio-755075	75 x 50 x 75	12
3211-tio-756375	75 x 63 x 75	12
3211-tio-906390	90 x 63 x 90	6
3211-tio-115011	110 x 50 x 110	3
3211-tio-116311	110 x 63 x 110	3

Reducing Coupling

Code	Size	Pcs/Box
3211-rdc-252000	25 x 20	700
3211-rdc-322000	32 x 20	500
3211-rdc-322500	32 x 25	400
3211-rdc-402000	40 x 20	300
3211-rdc-402500	40 x 25	300
3211-rdc-403200	40 x 32	200
3211-rdc-502000	50 x 20	175
3211-rdc-502500	50 x 25	175
3211-rdc-503200	50 x 32	125
3211-rdc-504000	50 x 40	100
3211-rdc-632000	63 x 20	90
3211-rdc-632500	63 x 25	90
3211-rdc-633200	63 x 32	80
3211-rdc-634000	63 x 40	70
3211-rdc-635000	63 x 50	56
3211-rdc-752000	75 x 20	60
3211-rdc-752500	75 x 25	60
3211-rdc-753200	75 x 32	55
3211-rdc-754000	75 x 40	55
3211-rdc-755000	75 x 50	50
3211-rdc-756300	75 x 63	36
3211-rdc-905000	90 x 50	36
3211-rdc-906300	90 x 63	36
3211-rdc-907500	90 x 75	24
3211-rdc-110630	110 x 63	16
3211-rdc-110750	110 x 75	16
3211-rdc-110900	110 x 90	16

Female Elbow

Code	Size	Pcs/Box
3221-efo-200b00	20 x 1/2"	160
3221-efo-200c00	20 x 3/4"	130
3221-efo-250b00	25 x 1/2"	120
3221-efo-250c00	25 x 3/4"	100
3221-efo-320c00	32 x 3/4"	60
3221-efo-320b00	32 x 1/2"	60
3221-efo-321000	32 x 1"	56
3221-efo-401a06	40 x 1 1/4"	28

** Our several fittings with inserts could be produced with the following standards: CW602N , CW617N & CW625N*

Female Tee

Code	Size	Pcs/Box
3221-tfo-200b20	20 x 1/2″ x 20	125
3221-tfo-200c20	20 x 3/4″ x 20	100
3221-tfo-250b25	25 x 1/2″ x 25	100
3221-tfo-250c25	25 x 3/4″ x 25	80
3221-tfo-320c32	32 x 3/4″ x 32	45
3221-tfo-320b32	32 x 1/2″ x 32	45
3221-tfo-321032	32 x 1″ x 32	40
3221-tfo-401a40	40 x 1 1/4″ x 40	20

Female Nipple

Code	Size	Pcs/Box
3221-nfo-200b00	20 x 1/2″	200
3221-nfo-200c00	20 x 3/4″	180
3221-nfo-250b00	25 x 1/2″	200
3221-nfo-250c00	25 x 3/4″	150
3221-nfo-320b00	32 x 1/2″	110
3221-nfo-320c00	32 x 3/4″	110
3221-nfo-321000	32 x 1″	90

Male Nipple

Code	Size	Pcs/Box
3221-nmo-200b00	20 x 1/2″	200
3221-nmo-200c00	20 x 3/4″	150
3221-nmo-250b00	25 x 1/2″	180
3221-nmo-250c00	25 x 3/4″	140
3221-nmo-320b00	32 x 1/2″	100
3221-nmo-320c00	32 x 3/4″	100
3221-nmo-321000	32 x 1″	90

** Our several fittings with inserts could be produced with the following standards: CW602N , CW617N & CW625N*

Female Nipple - Octa

Code	Size	Pcs/Box
3221-nfo-321006	32 x 1″	70
3221-nfo-401a06	40 x 1 1/4″	40
3221-nfo-501b06	50 x 1 1/2″	30
3221-nfo-632006	63 x 2″	18
3221-nfo-752b06	75 x 2 1/2″	12
3221-nfo-903006	90 x 3″	7
3221-nfo-110406	110 x 4″	3

Male Nipple - Octa

Code	Size	Pcs/Box
3221-nmo-321006	32 x 1″	80
3221-nmo-401a06	40 x 1 1/4″	36
3221-nmo-501b06	50 x 1 1/2″	36
3221-nmo-632006	63 x 2″	15
3221-nmo-752b06	75 x 2 1/2″	8
3221-nmo-903006	90 x 3″	6
3221-nmo-110406	110 x 4″	3

Coupling

Code	Size	Pcs/Box
3211-muf-200000	20	600
3211-muf-250000	25	400
3211-muf-320000	32	200
3211-muf-400000	40	130
3211-muf-500000	50	75
3211-muf-630000	63	45
3211-muf-750000	75	28
3211-muf-900000	90	20
3211-muf-110000	110	10

** Our several fittings with inserts could be produced with the following standards: CW602N , CW617N & CW625N*

Chrome-Plated Valve

Code	Size	Pcs/Box
3241-vlk-200000	20 x 1/2″	30
3241-vlk-250000	25 x 3/4″	25
3241-vlk-320000	32 x 1″	20

Ball Valve

Code	Size	Pcs/Box
3241-vlb-200003	20	60
3241-vlb-250003	25	50
3241-vlb-320003	32	25
3241-vlb-400003	40	15
3241-vlb-500003	50	10
3241-vlb-630003	63	6
3241-vlb-750003	75	5

Valve

Code	Size	Pcs/Box
3241-vlf-200000	20	40
3241-vlf-250000	25	30
3241-vlf-320000	32	20
3241-vlf-400000	40	20

** Our several fittings with inserts could be produced with the following standards: CW602N , CW617N & CW625N*

Transition Union - Female

Code	Size	Pcs/Box
3271-tuf-200b00	20 x 1/2"	200
3271-tuf-250c00	25 x 3/4"	120
3271-tuf-321000	32 x 1"	80
3271-tuf-401a00	40 x 1 1/4"	50
3251-tuf-200c00	20 x 3/4"	200
3251-tuf-250b00	25 x 1/2"	120
3251-tuf-251000	25 x 1"	120
3251-tuf-321a00	32 x 1 1/4"	80
3251-tuf-320c00	32 x 3/4"	100
3251-tuf-501b00	50 x 1 1/2"	36
3251-tuf-632000	63 x 2"	14
3251-tuf-752b00	75 x 2 1/2"	12
3251-tuf-903000	90 x 3"	6
3251-tuf-110400	110 x 4"	3

Transition Union - Male

Code	Size	Pcs/Box
3271-tum-200b00	20 x 1/2"	200
3271-tum-250c00	25 x 3/4"	120
3271-tum-321000	32 x 1"	80
3271-tum-401a00	40 x 1 1/4"	40
3251-tum-200c00	20 x 3/4"	200
3251-tum-250b00	25 x 1/2"	100
3251-tum-251000	25 x 1"	100
3251-tum-321a00	32 x 1 1/4"	70
3251-tum-320c00	32 x 3/4"	80
3251-tum-501b00	50 x 1 1/2"	30
3251-tum-632000	63 x 2"	14
3251-tum-752b00	75 x 2 1/2"	8
3251-tum-903000	90 x 3"	5
3251-tum-110400	110 x 4"	3

** Our several fittings with inserts could be produced with the following standards: CW602N , CW617N & CW625N*

Coupling with Loose Nut

Code	Size	Pcs/Box
3251 -mft- 200000	20	150
3251 -mft- 250000	25	90
3251 -mft- 320000	32	60

Flange Set

Code	Size	Pcs/Box
3221-sls-500000	50	25
3221-sls-630000	63	15
3221-sls-750000	75	10
3221-sls-900000	90	10
3221-sls-110000	110	6

Stopend

Code	Size	Pcs/Box
3291-ste-200000	20	1000
3291-ste-250000	25	600
3291-ste-320000	32	350
3291-ste-400000	40	200
3291-ste-500000	50	100
3291-ste-630000	63	60
3291-ste-750000	75	36
3291-ste-900000	90	24
3291-ste-110000	110	9

** Our several fittings with inserts could be produced with the following standards: CW602N , CW617N & CW625N*

Single Bracket

Code	Size	Pcs/Box
3591-bck-160001	16	5000
3591-bck-202201	20 x 22	5000
3591-bck-252701	25 x 27	5000
3591-bck-323401	32 x 34	2000
3591-bck-404201	40 x 42	2000
3591-bck-505201	50 x 52	1500

Double Bracket

Code	Size	Pcs/Box
3591-bck-160000	16 x 16	3000
3591-bck-202200	20 x 22	2500
3591-bck-252700	25 x 27	2000
3591-bck-323400	32 x 34	1000

Stopend

Code	Size	Pcs/Box
3291-ste-200b00	20 x 1/2″	800
3291-ste-250c00	25 x 3/4″	600
3291-ste-321000	32 x 1″	400

Stopend

Code	Size	Pcs/Box
3291-stu-200000	20 x 1/2″	275

Accessories

Scissors

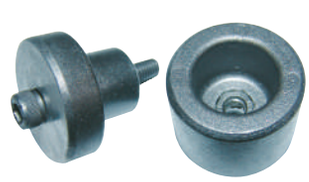
Code	Size	Pcs/Box
3592-sss-000002	16 / 42	100
3592-sss-000003	16 / 42 Otomatik	50

Welding Machine

Code	Size	Pcs/Box
3292-wmh-000001	Standart	
3292-wmh-000000	2006 Model	5

Welding Apparatus

Code	Size	Pcs/Box
3292-die-200000	20	1
3292-die-250000	25	1
3292-die-320000	32	1
3292-die-400000	40	1
3292-die-500000	50	1
3292-die-630000	63	1
3292-die-750000	75	1
3292-die-900000	90	1
3292-die-110000	110	1



Tube Sharpener

Code	Size	Pcs/Box
3292-shv-202500	20 x 25	
3292-shv-324000	32 x 40	
3292-shv-506300	50 x 63	
3292-shv-759000	75 x 90	

WARRANTY

For Kalde water Installation systems with PPR Pipes & Fittings(Product or Products)

Kalde Klima Orta Basinc ve Valf Sanayii A.S.'s ("Kalde") Products are manufactured according to international standards and they particularly conform to the DIN norms. This Limited Warranty provides that, subject to the following limitations, each Kalde Product will be free from defects in material and workmanship and will conform to Kalde's specification for the particular Product. Your exclusive remedy for any defective Product is limited to the repair or replacement of the defective Product within fifty (50) years from the date of purchase. If Kalde is unable to repair or replace, as applicable, a defective Product which is covered by this Limited Warranty, Kalde shall, within a reasonable time refund the purchase price of the Product.

This Limited Warranty covers only those defects that arise as a result of normal use, Kalde shall not be liable for any defects that are caused by the neglect, abuse, misuse or mistreatment by anyone or any entity other than Kalde, including but not limited to, improper installation or testing, user's flawed designs or specifications, unsatisfactory applications, use in conjunction with incompatible materials, contact with aggressive chemical agents, freezing or overheating of liquids in the product and any other neglect or misuse. This Limited Warranty shall be void if the Product fails to function properly as a result of any force majeure (i.e. earthquakes, flood, fire etc.) This Limited Warranty also specifically excludes failure or damage caused by fire stopping materials, tread sealants, plasticized vinyl products or damage caused by the fault or negligence of anyone other than Kalde, or defects that are caused by any Products that have been altered or modified in any way by a person or entity other than Kalde. Products must be used in accordance with standards, regulations and the applicable standards, failure to adhere to these standards shall void this Limited Warranty. Kalde shall have sole and absolute authority to decide whether the Product is covered under the Limited Warranty.

Kalde shall have a reasonable time to repair or replace a defective Product, after determining that a defective Product exists. Kalde's replacement Product under its Limited Warranty will be manufactured from new and serviceable used parts. Kalde's warranty applies to repaired or replaced Products for the balance of the applicable period of the original warranty or ninety days from the date of shipment of a repaired or replaced Product, whichever is longer. For warranty application the end-user must present the purchase invoice.

Kalde's entire liability for any defective Product shall in no event exceed the purchase price for the defective Product. There are no warranties which extend beyond the face of Kalde's Limited Warranty. Kalde specifically disclaims all other warranties, express or implied, regarding the Products, including any implied warranties of merchantability, fitness for a particular purpose or satisfactory quality. In no event shall Kade or its third party suppliers be liable for direct, indirect, special, collateral, punitive, incidental or consequential damages, No claim or suit or action shall be brought against Kalde more than one year after the related cause of action has occurred. The foregoing liability limitations are essential elements of this Limited Warranty. No course of dealing or trade usage or course of performance shall be relevant to explain or supplement any term in this Limited Warranty. No addition to or modification of any provision of This Limited Warranty shall be binding upon Kalde unless made in writing and signed by Kalde Klima Orta Basınç ve Valf Sanayii A.Ş. This Limited Warranty shall be governed by and construed under the law of Republic of Turkey, without regard to the conflict of law principles thereof. All disputes arising out of or relating to this Limited Warranty shall be adjudicated at Istanbul Merkez Mahkemeleri, Turkey. Kalde doesn't provide any warranty to Products sold to U.S. and Canada.

NOTE: Kalde carries a Products Liability Insurance Policy from ERGO AŞ. that provides for EURO 2,000,000 per year to cover any third-party legal liability. For insurance application the internationally approved procedures are required. This Products Liability Insurance Policy does not include the damage claims made in connection with the (direct or indirect) sales made to countries that have been placed an embargo by USA or EU countries (including the OFAC countries). Kalde keeps the right to ask for any supplementary document necessary to approve damage indemnity.

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