

DST Group Ltd

Thermal Expansion Technical Submittal 2022



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Require Full Guiding

Available for any Temperature or Pressure

Supplied with CE Certs where Applicable

Internal Flow Liner as Standard

Bellows are Pre-Cold Drawn

DST Type AX2 Axial Bellows

Designed to accept linear expansion on copper and stainless steel pipe systems.

Standard product details are shown below, athough these may vary dependant upon application and PED requirements.

Material Specification

Flanges:

Convolutions: Internal Sleeve: Carbon Steel PN16 With Stainless steel facings (Stainless steel to all wetted areas) 316 Stainless Steel 316 Stainless Steel

Working Conditions

Pressure:	16 Bar
Temperature:	120 Degrees C
Test:	1.5x Working

PED Requirements

All Bellows supplied by DST Group Ltd are manufactured and certified in accordance with EU PED Legislation and as such carry the relevant CE certification where required.

Size (mm)	Axial Compression (mm)	Installed Length	Effective Area cm²	Force to Compress N/mm	Part Number
32nb / 35cu	30	130	12.8	37	AX2/032/PN16
40nb / 42cu	30	130	19.0	37	AX2/040/PN16
50nb / 54cu	50	225	35.6	55	AX2/050/PN16
65nb / 67cu	50	225	46.5	87	AX2/065/PN16
80nb/ 76cu	50	230	61.7	90	AX2/080/PN16
100nb / 108cu	50	230	103.2	116	AX2/100/PN16
125nb / 133cu	60	240	177.5	118	AX2/125/PN16
150nb / 159cu	60	240	253.6	166	AX2/150/PN16
200nb	70	275	453.5	176	AX2/200/PN16
250nb	70	280	684.6	276	AX2/250/PN16

The anchor loads generated by this type of Axial Expansion Compensator are high. A bracket guide with a low frictional resistance should be used.

Please note these units are not suitable for use on a drop rod system and need to be suitably guided (e.g. DST LF Slide Guide or DST 253 Slide Guide). Please consult the Expansion Compensator Application Guide for positioning of anchor points and subsequent support centres. (See page 116)

Primary Pipe Guide Spacings



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Require Full Guiding

Available in any Temperature or Pressure

Supplied with CE certs where Applicable

Internal Flow liner as Standard

Bellows are Pre-Cold Drawn

Material Specification



DST Type AX3 Axial Bellows

Designed to accept linear expansion on Steel & Copper pipe systems.

Working Conditions

Pressure: Temperature: Test: Standard 10 Bar (Upto 16 Bar - Dependant on PED Conditions) 120 Degrees C 1.5x Working

PED Requirements

All Bellows supplied by DST Group Ltd are manufactured and certified in accordance with EU PED Legislation and as such carry the relevant CE certification where required.

Size (mm)	Axial Compression (mm)	Installed Length	Effective Area cm ²	Force to Compress N/mm	Part Number
15	25	200	3	3.9	AX3/015/MSC(25)
20	25	200	6	7.8	AX3/020/MSC(25)
25	25	200	9	12.7	AX3/025/MSC(25)
32	25	210	13	17.2	AX3/032/MSC(25)
40	25	220	20	19.6	AX3/040/MSC(25)
50	25	250	30	19.6	AX3/050/MSC(25)
65	25	273	50	25.0	AX3/065/MSC(25)
15	50	300	3	3.9	AX3/015/MSC(50)
20	50	300	6	7.8	AX3/020/MSC(50)
25	50	300	9	12.7	AX3/025/MSC(50)
32	50	310	13	17.2	AX3/032/MSC(50)
40	50	320	20	19.6	AX3/040/MSC(50)
50	50	350	30	19.6	AX3/050/MSC(50)

The anchor loads generated by using this type of Axial Expansion Compensator are high. It is worth keeping in mind the type of pipework bracketry that will be used. A guide bracket with a low frictional resistance should be used such as DST LF Slide guides or DST Guide Clips.

Please note these units are not suitable for use on a drop rod system and need to be suitably guided. Please consult the Expansion Compensator Application Guide for positioning of anchor points and subsequent support centres. (See Page 116)

Primary Pipe Guide Spacings



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AXIAL BELLOWS Operating & Maintenance Instructions



General Information:

Axial expansion joints are intended to compensate for axial expansion movements in straight pipeline sections.

Prerequisite for the application of axial expansions is the presence of appropriate anchor points and axial guides.

On site the general due diligence requirements to avoid corrosion damage must be observed, such as water treatment, or prevention of galvanic corrosion in copper and galvanized pipes.

Warranty:

All axial bellows carry a 12 month or 1000 cycle (whichever occurs first) warranty against manufacturing defect. The warranty does not cover poor workmanship, damage, or any failure occuring from poor installation or poor system design. The warranty covers only the supply of a replacement product. We reserve the right to charge for a replacement product should damage occur as a result of failure of 3rd Party system components, supports, anchors or guides.

Pre-installation Check

1. ALL Axial bellows must be installed in a system which correctly incorporates:

- i. Suitable ANCHORS at each end of the run in which the Axial Bellows are to be installed.
- ii. Primary and secondary guides on each side of the Axial Bellows (Primary Guides 2-4 Pipe Diameters and Secondary guides 12-14 Pipe Diametes from the face of the bellows).
- iii. Guiding of the pipework at every bracket location between the secondary guide and the anchor with a suitably low friction product.
- 2. DST Group recommends the use of "STOPS" or welding the anchor directly to the pipe to prevent the pipe from slipping through anchor brackets.

3. Any supporting structure needs to be fitted so that it is unable to move, in any direction.

- i. As a rule of thumb, any drop rods from slide guides to brackets should only be long enough to fit the bracket directly to the guide with minimal drop rod showing.
- ii. If this is not possible, drop rods must not exceed 100mm but it should be accepted that at this length there is inherant flexibility in the drop rod that could result in failure of the system, and the additional height could lead to a pendulumic movement which adds stress to the fixings and boss of the guides and pipe clips. If Insulation blocks are being used inside pipe clips, YOU MUST subtract the thickness
- iii. Drops to secondary steelwork should not exceed 50mm on a minimum diameter of M10. Any increased length on a trapeeze type of assembly will allow movement in all directions which will result in premature failures within the system or within the bellows.



The information provided by DST represent a design intent and concept only. DST Group Ltd cannot accept any liability for modification, variation or alteration to the specification proposed or content therein.

Installation (General) - (To Be Performed by Qualified Personnel)

Always install with the flow arrows on the bellows in the direction of the system flow.

1. Bolts - Bolts should be inserted from the bellows side. On some larger bolt lengths this may not be possible. In these cases a bolt of the exact and correct length needs to be selected. Please select the bolt length carefully; even if there is space between the bolt and the convolutions of the bellow in an un-pressurised state, they may foul when pressurized and cause failure. Bolts of the right diameter must be used to ensure correct alignment.

2. Alignment - Take care when inserting the bellows into the gap between the two mating flanges or fittings. The gap must be exactly the face to face dimension of the bellows. Care must be taken not to extend or compress the bellows during fitting. When using flanges, the sealing face of the bellows must be concentric with the sealing face of the mating flanges.

3. Final Fix - Great care must be taken with the tightening of the flange bolts. Tighten opposite bolts to get an even pressure all round (check the gap between the flanges). If screwed fitting are being used, please see the following page.

- 4. Testing All bellows are capable of being tested to 1.5x their working pressure.
 - i. DO NOT test the system without ensuring that both anchors are installed correctly.
 - ii. Put a black marker pen line next to the anchor as a visual aid if the line moves when testing,
 - the anchor is not working and the test should be stopped immediately.
 - iii Check all guides are installed correctly especially the primary and secondary guides prior to test.



AXIAL BELLOWS Operating & Maintenance Instructions

Screwed Axial Bellows Installation (AX3's)

Screwed AX3 Bellows are internally sleeved axial bellows suitable for 25mm or 50mm axial compression. They are supplied with internal sleeves and are not capable of extension. Please follow the guidelines below to ensure that you achieve the most longevity out of the bellows.



- 6. ALL Axial bellows must be installed in a system which correctly incorporates:
 - i. Suitable ANCHORS at each end of the run in which the Axial Bellows are to be installed.
 - ii. Primary and secondary guides on each side of the Axial Bellows (Priamry Guides 2-4 Pipe Diameters and Secondary guides 12-14 Pipe Diametes from the face of the bellows).
 - iii. Guiding of the pipework at every bracket location between the secondary guide and the anchor with a suitably low friction product.

AXIAL BELLOWS Operating & Maintenance Instructions



Axial Bellows Installation (General)

Please see below some general layouts incorporating Axial Bellows configured with guides and anchors, please ensure that installation is carried out in accordance with these methods.

SINGLE BELLOWS IN STRAIGHT RUN:



"T" OR "L" SHAPE RUN OF PIPEWORK



Stress Corrosion Cracking:

Stress corrosion cracking (SCC) is a phenomenon experienced from time to time in stainless steels. It is generally not well understood, and can, given the right conditions, cause catastrophic failure. The following notes are for general guidance only and are based on our knowledge and experience – we cannot consider ourselves an expert in this field.

The materials considered susceptible to SCC are austenitic stainless steels (304/304L/316/316L grades being the most common). For SCC to occur it is necessary that there are chloride ions present, along with stress (applied or residual). For both of these factors, the higher the chloride ion concentration/stress, the worse the situation from an SCC perspective. In addition, the stainless steel needs to be within a susceptible temperature range. This is generally considered to be 60° to 100°C, although to be on the safe side, some people consider any duties between 50° and 120°C.

Whilst every effort is made to lessen the possibility of SCC occurring within the manufacture of our products, and within the installation instruction supplied. It should also be noted that applied stress is inherant within the fitting process of this product. As we cannot control the fitting, temperature or the potential for chloride ions to be present, any form of SCC or possible failure that could be atributed to SCC are not covered by our standard warranty.

FA1 for steel pipes

FA2 for copper & stainless steel

Supplied with CE certs where applicable

Internal flow liner as standard



FA1/200/PN16

FA1/250/PN16



Size	Installed Length +/- 25 (mm)	Force to Deflect +/- 25mm (N/mm)	Installed Length +/- 50 (mm)	Force to Deflect +/- 50 (mm)	Part Number
25	500	10.7	500	2.8	FA1/025/PN16
32	350	10.7	500	2.8	FA1/032/PN16
40	350	10.7	500	2.8	FA1/040/PN16
50	350	12.1	500	4	FA1/050/PN16
65	350	15.9	500	5	FA1/065/PN16
80	350	56.7	500	16	FA1/080/PN16
100	350	94.0	500	27	FA1/100/PN16
125	500	21.6	500	11	FA1/125/PN16
150	500	38.2	650	19	FA1/150/PN16
200	500	29.8	700	17	FA1/200/PN16
250	500	55.2	700	32	FA1/250/PN16
Size	Installed Length +/- 75 (mm)	Force to Deflect +/- 75mm (N/mm)	Installed Length +/- 100 (mm)	Force to Deflect +/- 100 (mm)	Part Number
25	750	1.3	900	1.3	FA1/025/PN16
32	750	1.3	900	1.3	FA1/032/PN16
40	750	1.3	900	1.3	FA1/040/PN16
50	750	1.7	900	1.3	FA1/050/PN16
65	750	2.2	900	1.3	FA1/065/PN16
80	750	7.7	900	2.7	FA1/080/PN16
100	750	12.3	900	5.4	FA1/100/PN16
125	800	4.3	1000	5.4	FA1/125/PN16
150	800	11.1	1000	4.5	FA1/150/PN16

Material Specification

900

900

200

250

Connections:	Carbon Steel Drilled PN1 6 (Van-stone Facings on FA2)
Convolutions:	321 Stainless Steel (316 Stainless steel on FA2)
Internal Sleeve:	321 Stainless Steel (316 Stainless steel on FA2)
Tie Rods:	Carbon Steel
Hemispherical W ashers:	Carbon Steel
Connecting Spool:	Carbon Steel (316 Stainless steel on FA2)

11.5

22.8

The DST Type FA1 & FA2 Lateral Expansion compensator is suitable for use on systems up to 250°C at 16 bar pressure PED certification supplied dependant upon application.

1000

1100

All units are supplied at installation lengths and are pre stressed. Please note DST Group Ltd can design and supply lateral expansion compensators to accommodate higher system temperatures / pressures and other rates of lateral movement or special dimensions. Please advise at time of enquiry / order the system temperature and pressure to allow correct selection of compensator.

Standard Installation

These units are often used when new mains are being connected to existing mains. They allow a lateral movement to occur. These units are also useful for connections from boilers and plant, which will compensate any stresses put onto the "Headers". Advice should always be sought when using these units to ensure the units will allow the amount of movement which will occur. Please consult the Expansion Compensator Application Guide for positioning of the anchor points and subsequent support centres. (See page 116)

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4.5

4.5

AN1 for Steel Pipes

AN2 for Copper & Stainless Steel

Supplied with CE Certs where Applicable

Internal Flow Liner as Standard

Installed Length Size Angular Deflection Effective Area Force to Part Number cm² **Deflect Nm/deg** (mm) 25 +/- 50 195 40 1.27 AN1/025/PN16 32 +/- 50 195 40 3.04 AN1/032/PN16 40 +/- 50 200 40 3.04 AN1/040/PN16 AN1/050/PN16 50 +/- 50 133 40 3.34 +/- 50 1.47 65 133 62 AN1/065/PN16 1.47 +/- 5º 80 133 81 AN1/080/PN16 100 +/- 50 133 127 1.27 AN1/100/PN16 3.04 125 +/- 6.50 199 195 AN1/125/PN16 150 +/- 6.50 199 273 3.04 AN1/150/PN16 200 +/-7.50 212 469 3.34 AN1/200/PN16 250 +/-7.50 212 700 3.04 AN1/250/PN16

Material Specification

AN2

The DST Type AN1 & AN2 Angular Expansion compensators are suitable for use on systems up to 200°C at 16 bar pressure. All units are supplied at installation lengths and are pre stressed. Please note DST Group Ltd can design and supply angular expansion compensators to accommodate higher system temperatures / pressures or special dimensions. Please advise at time of enquiry / order the system temperature and pressure to allow correct selection of compensator.

PED Requirements

CE Certificates issued if required. All units are catagorised to PED standards, and we require accurate temperatures and pressures at time of order to enable correct selection and certification.

Standard Installation

These units are commonly used in pairs, although three pin systems can be designed if required. Please contact our sales office for application and design advice. These units can be used on a drop rod system. Please consult the Expansion Compensator Application Guide for positioning of anchor points. (See page 116)

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	0	

GI1 for Steel Pipes

Gl2 for Copper & Stainless Steel

Supplied with CE Certs where Applicable

Internal Flow Liner as Standard





Size (mm)	Angular Deflection	Installed Length	Force to Deflect Nm/deg	Part Number
25	+/- 5º	195	8.3	GI1/025/PN16
32	+/- 5º	195	8.3	GI1/032/PN16
40	+/- 5º	195	8.3	GI1/040/PN16
50	+/- 5º	180	8.3	GI1/050/PN16
65	+/- 5º	180	10.1	GI1/065/PN16
80	+/- 5º	180	31.4	GI1/080/PN16
100	+/- 5º	180	60.8	GI1/100/PN16
125	+/- 6.5º	225	36.2	GI1/125/PN16
150	+/- 6.5°	225	55.3	GI1/150/PN16
200	+/- 7.5°	250	107.1	GI1/200/PN16
250	+/- 7.5°	250	192	GI1/250/PN16

Material Specification

Connections:	Carbon Steel Drilled PN16 (Van-stone facings on GI2)
	Other Flanges Available If Required
Convolutions:	321 Stainless Steel (316 Stainless steel on GI2)
Internal Sleeve:	321 Stainless Steel (316 Stainless steel on GI2)
Hinge Pins:	Carbon Steel

The DST Type GI1 & GI2 Gimbal Expansion compensators are suitable for use on systems up to 200°C at 16 bar pressure. All units are supplied at installation lengths and are pre stressed.

Please note DST Group Ltd can design and supply gimbal expansion compensators to accommodate higher system temperatures / pressures or special dimensions. Please advise at time of enquiry / order the system temperature and pressure to allow correct selection of compensator.

PED Requirements

CE Certificates issued if required. All units are catagorised to PED standards, and we require accurate temperatures and pressures at time of order to enable correct selection and certification.

Standard Installation

These units are commonly used in pairs, although three pin systems can be designed if required. Please contact our sales office for application and design advice. These units can be used on a drop rod system. (See page 116)

Expansion Products LF Range - Low Friction Guides

Construction

Mild Steel BZP Finish Low Friction Slide Insert

For Use With

Unlined & Rubber Lined Clips Surefix HD on Larger Sizes

Special Features

8"

10"

200

250

MAXIMUM TRAVEL

220

273

ד. 9 וביות	Tripla [Paccad							
Dual & I	n for t	rancha	rt	Туре	Inter	nal Thread	External Thread	Max Travel	SWL
LUCKADI	eiori	lanspo	or t	LF1	N	18/M10	N/A	65mm	0.5kN
				LF2-1		M10	M16	90mm	2.0kN
				LF2-2		M10	M16	120mm	2.0kN
				LF3-1	М	12/M16	1/2″	120mm	6.0kN
				LF3-2	М	12/M16	1/2″	135mm	6.0kN
				l	.F1		LF2-*	l	.F3-*
						LF2-1	LF2-2	LF3-1	LF3-2
Steel		Steel	CU						
NB	NB	OD	OD	LF1-***UL	LF1-*** <mark>RL</mark>	LF2-*-***UL	LF2-*- <mark>RL</mark>	LF3-*- <mark>UL</mark>	LF3-*- <mark>RL</mark>
			15		LF1-015RL		LF2-*-015RL		LF3-*-015RL
		18		LF1-018UL	LF1-018RL	LF2-*-018UL	LF2-*-018RL	LF3-*-018UL	LF3-*-018RL
1/2"	15	21	22	LF1-021UL	LF1-022RL	LF2-*-021UL	LF2-*-022RL	LF3-*-021UL	LF3-*-022RL
3/4"	20	27	28	LF1-027UL	LF1-028RL	LF2-*-027UL	LF2-*-028RL	LF3-*-027UL	LF3-*-028RL
1"	25	34	35	LF1-034UL	LF1-035RL	LF2-*-034UL	LF2-*-035RL	LF3-*-034UL	LF3-*-035RL
1 1/4"	32	42	42	LF1-042UL	LF1-042RL	LF2-*-042UL	LF2-*-042RL	LF3-*-042UL	LF3-*-042RL
1 1/2"	40	48		LF1-048UL	LF1-048RL	LF2-*-048UL	LF2-*-048RL	LF3-*-048UL	LF3-*-048RL
			54		LF1-054RL		LF2-*-054RL		LF3-*-054RL
2"	50	60		LF1-060UL	LF1-060RL	LF2-*-060UL	LF2-*-060RL	LF3-*-060UL	LF3-*-060RL
			67				LF2-*-067RL		LF3-*-067RL
2 1/2"	65	76	76			LF2-*-076UL	LF2-*-076RL	LF3-*-076UL	LF3-*-076RL
3"	80	89				LF2-*-089UL	LF2-*-089RL	LF3-*-089UL	LF3-*-089RL
			108				LF2-*-108RL		LF3-*-108RL
4"	100	114				LF2-*-114UL	LF2-*-114RL	LF3-*-114UL	LF3-*-114RL
						HEAVY DUTY			
								LF3-*-***HDUL	LF3-*-***HDRL
			133						LF3-*-133HDRL
5"	125	140						LF3-*-140HDUL	LF3-*-140HDRL
			159						LF3-*-159HDRL
6"	150	168						LF3-*-168HDUL	LF3-*-168HDRL

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01524 389 494

LF2-2 120mm

LF3-*-220HDUL

LF3-*-273HDUL

LF3-1 120mm

LF3-*-220HDRL

LF3-*-273HDRL LF3-2 135mm

60mm

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LF2-1 90mm

DST AAB - Adjustable Anchor Brackerted on: For Steel, Copper & Stainless Steel Pipes Last Update

version: 15 Oct 2018 Version: 2.00 Last Updated: 25 May 2022

The DST AAB Adjustable Anchor Bracket banks either 2 or 3 Split split bands on a set of steel cleat which can be adjusted for height and fall.

As a standard upto 54mm od bands will be powder coated, with larger sizes BZP for steel pipes or powder coated for copper & stainless steel.

Other band combinations are available upon request including brass, stainless steel & thicker profile steel bands.

Pipe Size	Band Material	Band QTY	Finish	SWL (kN)	Part Code	Torque Settings
15	25 x 3	2	Black Powder Coat	2.0	AB1015	40nm
22	25 x 3	2	Black Powder Coat	2.0	AB1022	40nm
28	25 x 3	2	Black Powder Coat	2.0	AB1028	40nm
15	25 x 3	2	Black Powder Coat	2.0	AB1022	40nm
20	25 x 3	2	Black Powder Coat	2.0	AB1028	40nm
25	25 x 3	2	Black Powder Coat	2.0	AB1035	40nm
15	25 x 3	3	Black Powder Coat	3.0	AB2015	40nm
22	25 x 3	3	Black Powder Coat	3.0	AB2022	40nm
28	25 x 3	3	Black Powder Coat	3.0	AB2028	40nm
35	25 x 3	3	Black Powder Coat	3.0	AB2035	40nm
42	30 x 3	3	Black Powder Coat	6.5	AB2042	60nm
54	30 x 3	3	Black Powder Coat	6.5	AB2054	60nm
67	30 x 3	3	Black Powder Coat	6.5	AB2067	60nm
76	30 x 3	3	Black Powder Coat	6.5	AB2076	60nm
108	40 x 3	3	Black Powder Coat	8.0	AB2108	60nm
133	40 x 3	3	Black Powder Coat	8.0	AB2133	60nm
159	40 x 3	3	Black Powder Coat	8.0	AB2159	60nm
15	25 x 3	3	Black Powder Coat	3.0	AB2022	40nm
20	25 x 3	3	Black Powder Coat	3.0	AB2028	40nm
25	25 x 3	3	Black Powder Coat	3.0	AB2035	40nm
32	25 x 3	3	Black Powder Coat	3.0	AB2042	60nm
40	30 x 3	3	Black Powder Coat	6.5	AB2040	60nm
50	30 x 3	3	BZP	6.5	AB2050	60nm
65	30 x 3	3	BZP	6.5	AB2065	60nm
80	30 x 3	3	BZP	6.5	AB2080	60nm
100	40 x 3	3	BZP	8.0	AB2100	60nm
125	40 x 3	3	BZP	8.0	AB2125	60nm
150	40 x 3	3	BZP	8.0	AB2150	60nm

Construction

Mild Steel BZP Finish High Tensile BZP Set Screws

For Use With

Copper, Steel & Stainless Steel pipes

Special Features

Adjustable Height & Angle to facilitate fall in pipework.



Pipework & Expansion Guide Thermal Expansion

It is an accepted rule of physics that a material, when subjected to a change of temperature, will expand or contract directly related to the temperature. Pipework is therefore subject to the same principal.

Factors to be considered when calculating the amount of expansion are as follows:

- 1. The amount of temperature change based upon the lowest ambient temperature.
- 2. The overall length of pipe upon which calculations are to be based.
- 3. The co-efficient of expansion for the required material.

Carbon Steel Pipes

The co-efficient of expansion for carbon steel is:	$0 - 100^{\circ}C = Cof\Delta 1.11$
(These Co-efficients can be used for standard stainless steels)	$101^{\circ}C + = Cof\Delta 1.21$
Copper Pipes	
Copper expands at a 50% higher rate, the equation would be:	$0 - 100^{\circ}C = Cof\Delta 1.11 \times 1.5$
(These Co-efficients can be used for thin wall stainless steels)	$101^{\circ}C + = Cof\Delta 1.21 \times 1.5$

Plastic Pipes

The rate of expansion for plastics differs between materials and manufacturers; it is always advisable to check the rate of thermal expansion with the manufacturer.

The following table shows the expansion ratio in mm/m. This can be used instead of calculating individual sections of pipe.

	Expansion Ratio of Pipe										
Steam or V	Vater Temperature	Expansion in mm/m									
٥C	٥F	Steel Pipes	Copper Pipes								
0	0	0	0								
65	149	0.72	1.08								
82	180	0.91	1.37								
120	248	1.45	2.18								
134	272	1.62	2.43								
144	290	1.74	2.61								
152	305	1.83	2.76								
170	338	2.05	3.09								
184	363	2.23	3.34								
198	388	2.39	n/a								
205	405	2.48	n/a								
217	422	2.62	n/a								
226	439	2.73	n/a								

By using the table above we can extract the movement ratio in mm/m and multiply by the total length of pipe-work:

Example 1

To calculate the expansion on a 75m length of carbon steel pipe passing 10bar steam:

Temperature Rise	= 184°C	
Expansion in mm/m	= 2.23mm/m	
Pipe Length	= 75m	
Total Expansion	= 75 x 2.23 =	167.5mm∆

Example 2

To calculate the expansion on a 25m length of copper pipe supplying LTHW at 82°C:

= 82°C					
= 1.37mm/m					
= 25m					
= 25 x 1.37	=	34.25mm∆			
	= 82°C = 1.37mm/m = 25m = 25 x 1.37	= 82°C = 1.37mm/m = 25m = 25 x 1.37 =			

Created on: 15 Oct 2018 Version: 2.00 Last Updated: 25 May 2022

Pipework & Expansion Guide

Flange Dała Table

Nominal	Flange	Outer	№ of Bolt	Bolt	Bolt Circle	Nominal	Flange	Outer	№ of Bolt	Bolt	Bolt Circle	
Size	Table	Ø	Holes	Hole Ø	(P.C.D)	Size	Table	Ø	Holes	Hole Ø	(P.C.D)	
	E	95	4	14	67		E	184	4	18	146	
	F	95	4	14	67		F	203	8	18	165	
	H	114	4	18	83		H	203	8	18	165	
45	150	89	4	16	60		150	191	4	19	152	
15mm	300 6	95	4	10	6/ EE	80 mm ۲″	300	210	8	10	108	
12	0	80	4	14	55 65	,	10	200	4	18	150	
	16	95	4	14	65		10	200	Q	10	160	
	25	95	4	14	65		25	200	8	18	160	
	F	101	4	14	73		F	216	8	18	178	
	F	101	4	14	73		F	229	8	18	191	
	Н	114	4	18	83		Н	229	8	18	191	
	150	98	4	16	70		150	229	8	19	191	
20 mm	300	117	4	19	83	100 mm	300	254	8	22	200	
³ /4″	6	90	4	11	65	4″	6	210	4	18	170	
	10	105	4	14	75		10	220	8	18	180	
	16	105	4	14	75		16	220	8	18	180	
	25	105	4	14	75		25	235	8	22	190	
	E	115	4	14	83		E	254	8	18	210	
	F	121	4	18	87		F	279	8	22	235	
	Н	121	4	18	87		Н	279	8	22	235	
	150	108	4	16	79		150	254	8	22	216	
25 mm	300	124	4	19	89	125 mm	300	279	8	22	235	
1″	6	100	4	11	75	6″	6	240	8	18	200	
	10	115	4	14	85		10	250	8	18	210	
	16	115	4	14	85		16	250	8	18	210	
	25	115	4	14	85		25	270	8	26	220	
	E	121	4	14	8/		E	279	8	22	235	
27 mm	F	133	4	10	98		F	305	12	22	260	
	150	133	4	16	90		150	305	12	22	200	
	300	117	4	10	09	150 mm	300	279	0	22	241	
1 ¹ /4″	6	120	4	14	90	6″	500	265	8	18	270	
	10	140	4	18	100		10	285	8	22	240	
	16	140	4	18	100		16	285	8	22	240	
	25	140	4	18	100		25	300	8	26	250	
	E	121	4	14	98		E	337	8	22	292	
	F	133	4	18	105		F	368	12	22	324	
	н	133	4	18	105		н	368	12	22	324	
40 mm	150	117	4	16	98	200 mm	150	343	8	22	298	
1 ¹ /2″	300	133	4	22	114	8″	300	381	12	25	330	
	6	120	4	14	100		6	320	8	18	280	
	10	140	4	18	110		10	340	8	22	295	
	16	140	4	18	110		16	340	12	22	295	
	25	140	4	18	110		25	360	12	26	310	
	E	152	4	18	114		E	406	12	22	356	
	F	165	4	18	127		F	432	12	25	381	
	H	165	4	18	127		H	432	12	25	381	
50 mm	150	152	4	19	121	250 mm	150	406	12	25	362	
2"	300	105	8	19	12/	10″	300	444	12	29	38/	
	10	140	4	14	110		0	3/5	12	18	333	
	16	165	4	10	125		10	292 405	12	22	350	
	25	165	4	18	125		25	425	12	30	370	
	F	165	4	18	127		F	457	12	25	406	
	F	184	8	18	146		F	489	16	25	438	
	H	184	8	18	146		н	489	16	25	438	
65 mm	150	178	4	19	140	300 mm	150	482	12	25	432	
$2^{1}/2^{2}$	300	191	8	22	149	<u>12″</u>	300	521	16	32	451	
	6	160	4	14	130		6	440	12	22	395	
	10	185	4	18	145		10	445	12	22	400	
	16	185	4	18	145		16	460	12	26	410	
	25	185	8	18	145		25	485	16	30	430	

Key:

E = BS10 Tal	ole 'E'
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F = BS10 Table 'F'

H = BS10 Table 'H'

150 = BS1560 Class 150, ASA 150, ANSI B16.5 Class 150

300 = BS1560 Class 300, ASA 300, ANSI BS16.5 Class 300

6 = BS4504 PN6, DIN2501 PN6

10 = BS4504 PN10, DIN2501 PN16

16 = BS4504 PN16, DIN 2501 PN16

25 = BS4504 PN25, DIN2501 PN25

Pipework & Expansion Guide Useful Conversion Factors

Pressure Units

Symbol	Description	Bar	kPA	kN/m²	psi	atm	m wg
1 bar	Bar		100.0	100.0	14.5037	0.9869	10.1972
1 kPa	Kilopascal	0.01		1.0	0.145	0.0099	0.102
1 kN/m ²	Kilonewton per square metre	0.01	1.0		0.145	0.0099	0.102
1 psi	Pound per square inch	0.0689	6.8948	6.8948		0.0681	0.07031
1 atm	Atmosphere	1.0133	101.3250	101.3250	14.696		10.3323
1 m wg	Metre water gauge	0.0981	9.8067	9.8067	1.422	0.0968	

Vacuum Units

Symbol	Description	mm	Hg in Hg	psi	Torr	bar	atm
1mm Hg	Millimetre of mercury		0.0394	0.49	1.0	0.0013	0.0013
1 in Hg	Inch of mercury	25.4 0.019		25.4	0.00338	0.0334	
1 psi	Pound per square inch	51.7	2.04		51.7	0.0689	0.0681
1 Torr	Torr	1.0	0.0394	0.49		0.0013	0.0013
1 bar	Bar	750	29.53	14.5037	750		0.9869
1 atm	Atmosphere	760	29.92	14.696	760	1.0133	

Linear Units

Symbol	Description	mm	cm	m	in	ft	yd
1 mm	Millimetre		0.1	0.001	0.0394	0.0033	0.0011
1 cm	Centimetre	10		0.1	0.3937	0.0328	0.0109
1 m	Metre	1000	100		39.3701	3.2808	1.0936
1 in	Inch	25.4	2.54	0.0254		0.0833	0.0278
1 ft	Foot	304.8	30.48	0.3048	12		0.3333
1 yd	Yard	914.4	91.44	0.9144	36	3	

Weight Units

Symbol	Description	g	kg	t	ΟZ	lb	tn
1 g	Gramme		0.001	0.000001	0.036	0.0022	0.0000098
1 kg	Kilogramme	1000		0.001	36.413	2.2047	0.0009843
1 t	Tonne (metric)	1000000	1000		36413.44	2204.7222	0.984251
1 oz	Ounce	28.4	0.0284	0.0000284		0.0625	0.0000279
1 lb	Pound	453.6	0.4536	0.0004536	16		10.0004465
1 tn	Ton (imperial)	1016000	1016	1.016	35840	2240	

Temperature Units

Symbol	Description	°C	٥F	٥K
٥C	Degree Celsius		Times 1.8, plus 32	Plus 273.16
٥F	Degree Farenheit	Minus 32 divide 1.8		Divide 1.8 plus 255.38
٥K	Degree Kelvin	Minus 273.16	Minus 255.38	

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Created on: 15 Oct 2018 Version: 2.00 Last Updated: 25 May 2022

Pipework & Expansion Guide Pipe Data Table

Nominal Size	Material	Wall Thickness	Max O/D	Min O/D	Mean I/D	Int Cross Section Area	Metal Cross Section Area	Surface Area	Moment of Inertia	Section Modulus	Pipe Weight	Water Content
		mm	mm	mm	mm	mm ²	mm²	m²	cm⁴	cm ³	kg/m	l/m
15 mm ¹ /2″ 15 mm	Heavy Steel Medium Steel Copper (Table X) Copper (Table Y) Copper (Table Z)	3.25 2.65 0.70 1.00 0.50	21.7 31.7 15.045 15.045 15.045	21.1 21.1 14.965 14.965 14.965	14.9 16.2 13.6 13.0 14.0	175 205 145 133 154	186 155 31.6 44.1 22.9	0.067 0.067 0.047 0.047 0.047	0.79 0.71 0.08 0.11 0.06	0.736 0.656 0.108 0.145 0.080	1.45 1.22 0.28 0.39 0.20	0.175 0.250 0.145 0.133 0.154
20 mm ³ /4″ 22 mm	Heavy Steel Medium Steel Copper (Table X) Copper (Table Y) Copper (Table Z)	3.25 2.65 0.90 1.20 0.60	27.2 27.2 22.055 22.055 22.055	26.6 26.6 21.975 21.975 21.975	20.4 21.6 20.2 19.6 20.8	326 367 321 302 340	243 203 59.6 78.3 40.2	0.085 0.085 0.069 0.069 0.069	1.75 1.50 0.33 0.43 0.23	1.29 1.11 0.303 0.387 0.210	1.90 1.58 0.52 0.69 0.35	0.326 0.367 0.321 0.302 0.340
25mm 1″ 28 mm	Heavy Steel Medium Steel Copper (Table X) Copper (Table Y) Copper (Table Z)	4.05 3.25 0.90 1.20 0.60	34.2 34.2 28.055 28.055 28.055	33.4 33.4 27.975 27.975 27.975	25.7 27.3 26.2 25.6 26.83	518 586 540 516 565	380 312 76.7 101 51.7	0.106 0.106 0.085 0.085 0.085	4.29 3.70 0.71 0.91 0.49	2.54 2.20 0.504 0.650 0.347	2.97 2.44 0.68 0.89 0.46	0.518 0.586 0.540 0.516 0.565
32 mm 1 ¹ /4″ 35 mm	Heavy Steel Medium Steel Copper (Table X) Copper (Table Y) Copper (Table Z)	4.05 3.25 0.90 1.20 0.70	42.9 42.9 35.07 35.07 35.07	42.1 42.1 34.99 34.99 34.99	34.3 35.9 32.6 32.0 33.6	927 1016 837 806 889	490 461 128 158 75.5	0.134 0.134 0.110 0.110 0.110	9.16 7.74 1.83 2.22 1.11	4.31 3.64 1.043 1.270 0.635	3.84 3.14 1.12 1.39 0.67	0.926 1.016 0.837 0.806 0.889
40 mm 1 ¹ /2″ 42 mm	Heavy Steel Medium Steel Copper (Table X) Copper (Table Y) Copper (Table Z)	4.05 3.25 1.20 1.50 0.80	48.8 48.8 42.07 42.07 42.07	48.0 48.0 41.99 41.99 41.99	40.2 41.9 39.6 39.0 40.4	1272 1376 1234 1197 1284	566 461 154 191 104	0.152 0.152 0.132 0.132 0.132	13.98 11.78 3.21 3.93 2.20	5.79 4.87 1.528 1.869 1.048	4.43 3.61 1.36 1.69 0.91	1.271 1.376 1.234 1.197 1.284
50 mm 2″ 54 mm	Heavy Steel Medium Steel Copper (Table X) Copper (Table Y) Copper (Table Z)	4.50 3.65 1.20 2.00 0.90	60.8 60.8 54.07 54.07 54.07	59.8 59.8 53.99 53.99 53.99	51.3 53.0 51.6 50.0 52.2	2070 2205 2095 1965 2145	784 651 199 327 150	0.189 0.189 0.170 0.170 0.170	30.8 26.2 7.0 11.1 5.3	10.2 8.7 2.573 4.101 1.963	6.17 5.10 1.76 2.88 1.33	2.070 2.205 2.095 1.965 2.145
65 mm 2 ¹ /2″ 67 mm	Heavy Steel Medium Steel Copper (Table X) Copper (Table Y) Copper (Table Z)	4.50 3.65 1.20 2.00 1.00	76.6 76.6 66.75 66.75 66.75	75.4 75.4 66.60 66.60 66.60	67.00 68.7 64.3 63.1 64.7	3530 3700 3245 3125 3285	1005 831 247 406 206	0.239 0.239 0.209 0.209 0.209	64.5 54.5 13.2 21.3 11.1	170 14.3 3.97 6.38 3.34	7.90 6.51 2.18 3.58 1.82	3.530 3.700 3.245 3.125 3.285
80 mm 3″ 76 mm	Heavy Steel Medium Steel Copper (Table X) Copper (Table Y) Copper (Table Z)	4.85 4.05 1.50 2.00 1.20	89.5 89.5 76.3 76.3 76.3	88.1 88.1 76.15 76.15 76.15	79.0 80.7 73.2 72.2 73.8	4905 5115 4210 4100 4280	1285 1080 352 467 283	0.279 0.279 0.239 0.239 0.239	114 97.0 24.4 31.9 19.9	25.6 21.8 6.45 8.43 5.22	10.1 8.47 3.11 4.11 2.50	4.905 5.115 4.210 4.100 4.280
100 mm 4″ 108 mm	Heavy Steel Medium Steel Copper (Table X) Copper (Table Y) Copper (Table Z)	5.40 4.50 1.50 2.00 1.20	114.9 114.9 108.25 108.25 108.25	113.3 113.3 108.0 108.0 108.0	103.3 105.1 105.1 103.1 103.7	8380 8680 8680 8355 8780	1840 1540 504 832 405	0.358 0.358 0.340 0.340 0.340	272 231 71.4 115 71.2	47.7 40.6 13.21 21.41 10.66	14.4 12.1 4.45 7.33 3.57	8.380 8.680 8.680 8.355 8.780
125 mm 5″ 133 mm	Heavy Steel Medium Steel Copper (Table X) Copper (Table Y) Copper (Table Z)	5.40 4.85 1.50 1.50	140.6 140.6 133.5 133.5	138.7 138.7 133.25 133.25	127.7 129.8 130.4 130.4	13050 13250 13350 13350	2270 2065 621 621	0.438 0.438 0.419 0.419	520 470 134 134	73.4 67.4 20.26 20.26	17.8 16.2 5.47 5.47	13.05 13.25 13.35 13.35
150 mm 6″ 159 mm	Heavy Steel Medium Steel Copper (Table X) Copper (Table Y) Copper (Table Z)	5.40 4.85 2.00 1.50	166.1 166.1 159.5 159.5	164.1 164.1 159.25 159.25	154.3 155.3 155.4 156.4	18700 18950 18950 19200	2700 2065 988 743	0.518 0.518 0.501 0.501	862 787 304 203	105 95.4 38.42 29.09	21.2 19.2 8.71 6.55	18.70 18.95 18.95 19.20
200 mm 250 mm 300 mm	Steel Steel	4.88 6.35 7.14			209.3 260.4 309.6	34400 53250 75300	3280 5320 7080	0.689 0.859 1.018	1880 4745 8865	172 347 547	25.9 42.0 55.8	34.42 53.24 75.30

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Pipework & Expansion Guide Support Centres - Data Table

	Support Spacing - Space Supports as Table										
Pipe Bore	Maximum Support Spacing (m)										
(mm) Nominal	Steel	Pipe	Coppe	r Pipe	Iron Pipe						
Hommu	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical					
Up to 15	1.8	2.4	1.2	1.8	-	-					
20	2.4	3.0	1.4	2.1	-	-					
25	2.4	3.0	1.8	2.4	-	-					
32	2.7	3.0	2.4	3.0	-	-					
40	3.0	3.6	2.4	3.0	-	-					
50	3.0	3.6	2.7	3.0	1.8	1.8					
65	3.7	4.6	3.0	3.6	-	-					
80	3.7	4.6	3.0	3.6	2.7	2.7					
100	3.7	4.6	3.0	3.6	2.7	2.7					
125	3.7	5.4	3.0	3.6	-	-					
150	4.5	5.4	3.6	4.2	3.7	3.7					
200	5.0	6.0	-	-	3.7	3.7					
250	5.0	6.0	-	-	4.5	5.4					
300	6.1	10.0	-	-	8.0	10.0					
350	10.0	12.0	-	-	-	-					
400	10.5	12.6	-	-	-	-					
450	11.0	13.2	-	-	-	-					
500	12.0	14.4	-	-	-	-					
600	14.0	16.8	-	-	-	-					

Pipe Bore (mm) Nominal	Maximum Support Spacing (m)					
	UPVC Pipe		PE Pipe		Glass Pipe	
	Class O,B,C Horizontal	Class D,E,6,7 Vertical	Type 32 Horizontal	Type 50 Vertical	Horizontal	Vertical
Up to 10	-	0.6	0.3	0.45	-	-
15	-	0.6	0.4	0.6	-	-
20	-	0.65	0.4	0.6	-	-
25	-	0.75	0.4	0.6	-	-
32	-	0.8	0.45	0.7	-	-
40	-	0.9	0.45	0.7	0.9	1.7
50	1.1	1.2	0.55	0.85	1.2	1.7
65	1.2	1.4	0.55	0.85	-	-
80	1.4	1.5	0.6	0.9	1.2	1.7
100	1.5	1.7	0.7	1.1	1.2	1.7
125	1.7	1.9	-	-	-	-
150	1.8	2.1	-	1.3	1.2	1.7
175	2.0	2.3	-	-	-	-
200	2.1	2.5	-	-	-	-
225	2.3	2.7	-	-	-	-
250	2.4	2.9	-	-	-	-
300	2.6	3.1	-	-	-	-
350	2.9	3.4	-	-	-	-
400	3.1	3.7	-	-	-	-
450	3.4	3.7	-	-	-	-

Nomograms



Conversion Tables

Flow Conversion Table



Multiply by conversion factor in direction of arrow. Divide by conversion factor for opposite requirement, eg. GPM \div 13.2 = L/SEC

Pressure Conversion Table



Divide by conversion factor for opposite requirement, eg. $PSI \div 1.42 = M$

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Our Ref: 58587502

14th April 2022

To Whom It May Concern,

RE: DST Group Ltd

We can confirm that we act as insurance brokers on behalf of the above insured, and that the following cover is in place:

Professional Indemnity

Insurer:	MGB Insurance Brokers Limited
Policy number:	To be Confirmed
Cover period:	8 th April 2022 to 31 st March 2023
Indemnity limit:	£2,000,000 any one claim and in the aggregate, including costs

Please Note:

The information provided in this document provides a brief overview of cover in place at the time this was sent. The full details of the above policy, including terms and conditions, are provided in their respective policy documentation. The expiry date given represents the normal expiry date of the policy. This document does not change cover provided. The cover stated above may change or be cancelled, and we are under no obligation to advise you as such.

Please contact us if you require any further information.

Yours sincerely

Kay Lang

Last updated : 30.09.22

Kay Lang Account Handler kay.lang@eastwoodib.co.uk Tel: 01484 820066



Our Ref: 58587502

10th March 2022

To whom it may concern:

DST Group Ltd

We are the appointed Insurance Brokers to the above named Company. We are therefore able to confirm the following Insurances are in force at the time of writing: -

Employers Liability Insurance				
Insurer:	QBE UK Limited			
Policy Number:	Y138787QBE0121A			
Cover Period:	8 th February 2022 – 7 th February 2023 inclusive			
Indemnity Limit:	£10,000,000 any one occurrence			
Public Liability Insurance				
Insurer:	QBE UK Limited			
Policy Number:	Y138787QBE0121A			
Cover Period:	8 th February 2022 – 7 th February 2023 inclusive			
Indemnity Limit:	£5,000,000 any one occurrence			
Products Liability Insurance				
Insurer:	QBE UK Limited			
Policy Number:	Y138787QBE0121A			
Cover Period:	8 th February 2022 – 7 th February 2023 inclusive			
Indemnity Limit:	£5,000,000 any one occurrence in the aggregate			

Eastwood Insurance Brokers is a trading style of Eastwood and Partners Ltd, authorised and regulated by the Financial Conduct Authority. Registered office: Northumberland House, Northumberland Street, Huddersfield HD1 1DT. Registered in England and Wales company no. 2560460.

Please Note:

The information provided in this document provides a brief overview of covers in place at the time this was sent. The full details of the above policies, including terms and conditions, are provided in Their respective policy documentation. The expiry date given represents the normal expiry date of The policy. This document does not change cover provided. The cover stated above may change or be cancelled, and we are under no obligation to advise you as such. Please contact us if you require any further information.

Yours sincerely

Kay Lang

Kay Lang Account Handler kay.lang@eastwoodib.co.uk Tel: 01484 820066



CERTIFICATE OF EMPLOYERS' LIABILITY INSURANCE (a)

(Where required by regulation 5 of the Employers' Liability (Compulsory Insurance) Regulations 1998 (the Regulations), one or more copies of this certificate must be displayed at each place of business at which the policy holder employs persons covered by the policy)

1. Name of policy holder Policy No Y138787QBE0122A

DST Group Ltd

- 2. Date of commencement of insurance policy 08 February 2022
- 3. Date of expiry of insurance policy 07 February 2023

We hereby certify that subject to paragraph 2:

- 1. the policy to which this certificate relates satisfies the requirements of the relevant law applicable in Great Britain, Northern Ireland, Isle of Man, Island of Jersey, Island of Guernsey, Island of Alderney; or any offshore installations in territorial waters around Great Britain and its Continental Shelf (b): and;
- 2. (a) the minimum amount of cover provided by this policy is no less than £5 million (c); or

(b) the cover provided under this policy relates to claims in excess of [£] but not exceeding [£].

3. the policy covers the holding company and all its subsidiaries

Signed on behalf of QBE UK Limited (Authorised Insurer)



Notes

- (a) Where the employer is a company to which regulation 3(2) of the Regulations applies, the certificate shall state in a prominent place, either that the policy covers the holding company and all its subsidiaries, or that the policy covers the holding company and all its subsidiaries except any specifically excluded by name, or that the policy covers the holding company and only the named subsidiaries.
- (b) Specify applicable law as provided for in regulation 4(6) of the Regulations.
- (c) See regulation 3(1) of the Regulations and delete whichever of paragraphs 2(a) or 2(b) does not apply. Where 2(b) is applicable, specify the amount of cover provided by the relevant policy.

Important

Display will be satisfied if the certificate is made available in electronic form and each relevant employee to whom it relates has reasonable access to it in that form.

QBE UK Limited (registered in England number 01761561; Home State - United Kingdom. Authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority; registration number 202842)

DST Group Limited June 2016 STANDARD CONDITIONS OF SALE

1) Interpretation

In these conditions the following terms have the following meaning:-

Seller - DST Group Limited

Buyer - The person, firm or company purchasing the products subject of the contract between the Seller and the Buyer

Products - The goods or materials which shall be the subject of the contract between the Seller and the Buyer

Price - The price specified in the Seller's quotation, acknowledgement, order or otherwise communicated to the Buyer and agreed

2) General

2.1. These conditions prevail over any conditions stipulated by the Buyer, whether express or by implication or incorporation. If the Buyer's documentation shall contain any conditions as to sale and purchase they shall be of no contractual effect between the Seller and the Buyer.

2.2. Save as is otherwise expressly agreed in writing by the Seller or as is expressly provided in these conditions all guarantees, warranties, conditions, representations or stipulations whether expressed or implied and whether arising hereunder or under any prior agreement or statement, or by statute, common law or otherwise are hereby excluded and negated, provided that nothing in this clause or elsewhere in these conditions shall operate to exclude the provisions of Section 12 of the Sales of Goods Act 1979 and the Consumer Rights Act 2015 or to exclude or restrict liability for death or personal injury resulting from the Seller's negligence.

2.3. In the event that the Buyer produces to the Seller at any stage conditions upon which the Buyer will enter any agreement to acquire the Products the terms of these Standard Conditions of Sale shall prevail over the Buyer's conditions in the event of conflict.

3) Orders

3.1. Orders for products shall be in writing and are accepted by the Seller subject to these conditions unless otherwise varied in writing.

3.2. Once an order has been placed by the Buyer it may not be suspended, cancelled or amended without the Seller's prior written agreement. The Buyer shall be responsible for the cost of all purchases, stocks, work-in-progress, labour costs, unrecovered overheads, and other expenses suffered by the Seller as a result of such suspension, cancellation or amendment.

3.3. Products are supplied specifically for the purposes mentioned in the Order/Order Acknowledgement and for no other purposes.

4) The Price

4.1. All prices given, published or put forward are quotations unless otherwise expressly stated therein. Prices quoted are prices prevailing at the date of quotation and are subject to increase. The Seller may at any time before delivery increase the price of the undelivered products or balance of the products by notice in writing to the Buyer. Prices invoiced are prices prevailing at the date of despatch.

4.2. Unless otherwise stated on acceptance, the price of the products shall include the Seller's costs of standard packing, normal insurance and delivery of the products to any one address in the United Kingdom maintained specified in writing by the Buyer and agreed by the Seller prior to delivery.

5) Payment

5.1. Unless otherwise stated on the Seller's invoice or otherwise agreed in writing, payment for the products shall be made not later than thirty days after the end of the month of invoicing but so that the Seller may at any time on or after acceptance by notice in writing to the Buyer vary the terms of payment by demanding immediate payment or (at the Seller's option) adequate security for sums which will be due hereunder.

5.2. Time of payment shall be of the essence and failure by the Buyer to pay the price or any installment thereof in due time shall entitle the Seller to treat such failure as a repudiation of the whole contract by the Buyer and to require the Buyer to make immediate payment of all monies due or become due and to recover from the Buyer damages for such breach of contract and/or (at the Seller's option) to charge interest at four per cent per annum above the base rate of Barclays Bank PLC from due date until payment.

6) Delivery

Unless otherwise agreed in writing between the Seller and the Buyer the following provisions shall apply:-

6.1. Delivery of the products shall have taken place when the products have been delivered to the address specified on the Seller's quotation, acknowledgement or other document or if the Buyer refuses to accept delivery, at the time when the products are due and ready for delivery in such latter instance the Seller shall be entitled to arrange storage for the products and to charge such storage and other costs to the Buyer and

the Buyer shall also be responsible for the payment of interest on any unpaid sum in accordance with clause 5.2.

6.2. The delivery date or dates specified on the Seller's acceptance of order are estimates only. The Seller shall not be liable for failure to deliver by such date or dates or for any damage or loss arising directly or indirectly out of delay in delivery; nor shall the Buyer be entitled to refuse to accept the Products because of latedelivery.

6.3. Where delivery is to be made by installments, each delivery shall be deemed for such purpose to be the subject of a separate contract and any failure whatsoever by the Seller in respect of any one delivery shall not entitle the Buyer to repudiate the contract or any installments remaining to be delivered thereunder.

6.4. The risk of any loss or damage to or deterioration of the products shall be borne by the Buyer from the time delivery has taken place in accordance with clause 6.1.

6.5. In respect of sea transit the Seller shall not be required to give the Buyer the notice relating to insurance of the products referred to in Section 32(3) of the Sales of Goods Act 1979 and the Consumer Rights Act 2015.

6.6. The Buyer is deemed to have accepted the Products after a period of 3 days after the date of delivery.

6.7. The Buyer shall make all necessary arrangements to take delivery of the Product on the date when the Products are tendered for delivery.

7) Property

Notwithstanding delivery and the passing of risk:-

7.1. The property in the products shall remain the Sellers until payment in full has been made to the Seller by the Buyer for the products and all other sums due to the Seller at the date of delivery of the products.

7.2. Where full payment has not been made to the Seller and the Buyer uses the products in his manufacturing process or incorporates the products with other products the products shall be retained by the Seller insofar as such products are identifiable and insofar as they are incorporated with other products the Seller's title in the products shall transfer into the product the Seller's title of sale of the products of sale of the products or of the products of which the products form a part. The Seller also reserves the right to trace into the products form a part to the extent that the Seller remains unpaid.

7.3. Until such payment is made the Buyer shall hold all products and materials the property in which is vested in the Seller on a fiduciary basis only and in any of the events specified above the Buyer shall store such products and materials so as to be marked and clearly identifiable as the property of the Seller in any dispute relating thereto.

7.4. The Buyer grants the Seller the right of entry (by force, if necessary) upon the Buyer's premises to recover the products if the Buyer is in breach.

8) Lien

The Seller shall in respect of all unpaid debts due from the Buyer under the same or any other contract have a general lien on all products and property of the Buyer in its possession (although the products or some of them may have been paid for) and shall after the expiration of fourteen days written notice to the Buyer be entitled to dispose of such products and property as it deems fit, and apply the proceeds towards such debts.

9) Loss/Damage/Storage

9.1. Unless otherwise agreed in writing between the Buyer and Seller the Seller may deliver against any order an excess and/ or deficiency up to ten per cent of weight or volume ordered without any liability whatsoever to the Buyer save that the price shall be adjusted accordingly.

9.2. The Buyer shall inspect the products immediately upon delivery and shall within 3 days of such delivery (time being of the essence) give notice in writing to the Seller and the carrier of all claims on account of damage to or total or partial loss of Products in transit. Claims for non-delivery must be submitted in writing to the Seller and the simulation of despatch. Quality claims must be made in writing immediately after the Buyer learns of the defect and in any event not later than thirty days after the Buyer's receipt of the products. Any claim not made in writing and received by the Seller within the doresaid time limits shall be deemed waived.

9.3. If the Buyer establishes to the satisfaction of the Seller that products have been damaged in transit or that the consignment is incomplete, the Seller will, at the Seller's option, repair or replace such products or credit the Buyer with the value thereof as appropriate, provided that the Buyer shall have given to the Seller written notification (otherwise than upon the carrier's delivery document) of such damage or shortage as provided in clause 9.2. The Seller shall be permitted a reasonable opportunity to inspect any damaged consignment and to investigate any shortage.

9.4. Save as provided in clause 9.3 above, the Seller shall not be liable to the Buyer for any loss or damage arising out of or in connection with products damaged or shortages.

9.5. If the Seller fails to make delivery or makes defective delivery of any one installment such failure or defective delivery shall not vitiate the contract as regards other installments. 9.6. The right of the Buyer to set off the value of any shortage, defective products or products not otherwise conforming to contract shall be restricted to the specific invoice for the products in question and shall not apply to previous or future accounts.

10) Liability/Limitation and Warranty

10.1. All conditions, guarantees, or warranties express or implied by statute, common law or otherwise including (but without prejudice to the generality of the foregoing) conditions, guarantees or warranties as to quality, fitness for purpose or description of the products or their life or wear or use under any conditions whether known or made known to the Seller or not are herebyexcluded.

10.2. The Seller's liability for any and all direct loss or damage resulting to the Buyer from defects in the products or any other cause shall be limited to the purchase price of the quantity of the products in respect of or in relation to which such loss or damage is claimed. The Seller shall not be liable for any loss, damage or expense caused to the Buyer by reason of any labour costs or other expenditure incurred by the Buyer or for any indirect or consequential loss or damage howsoever arising. Subject as aforesaid the Seller shall be under no liability in contract or in tort for any loss or damage or personal injury arising directly or indirectly out of the supply or use of the products or containers other Han death or personal injury resulting from the negligence of the Seller within the meaning of Section 1 of the Unfair Contract Terms Act 1977 and the Consumer Rights Act 2015.

11) Force Majeure

11.1. Deliveries may be partially or totally suspended by either party during any period in which it is prevented from manufacturing, delivering or taking delivery of the products through any circumstances outside its control. If because of such circumstances, the Seller is unable to supply the total requirement of the products the Seller may allocate its available supply (after satisfaction of its own requirements) amongst all of its customers, including those not under contract, as the Seller thinks fit. Deliveries so suspended shall be cancelled without liability, but the contract between the parties shall otherwise remain unaffected.

11.2. For the purpose of these conditions, circumstances outside the Seller's control include acts of God, strikes, lock-outs, other industrial action, fire, actident, lightning, earthquakes, storms, floods, explosion, war, governmental restriction and any other circumstances, whether similar or dissimilar, beyond the reasonable control of the Seller.

12) Indemnity

The Buyer shall indemnify the Seller in respect of all damage or injury occurring to any person, firm, company or property and against all actions, suits, claims and demands, charges or expenses in connection therewith for which the Seller may become liable in respect of the products sold under the contract in the event that the damage or injury shall have been occasioned otherwise than by the negligence of the Seller.

13) Default

The Seller reserves the right (without prejudice to its other rights and remedies) either to terminate the contract between the parties or to suspend further deliveries under it or require payment in advance in the event that the Buyer fails to pay for any one delivery when the same becomes due or the Buyer's financial responsibility becomes unsatisfactory to the Seller or if the Buyer, being a company, goes into liquidation or has a receiver appointed or not being a company has a receiving order made against him or enters into any arrangement or composition with creditors.

14) V.A.T.

All prices quoted are exclusive of all import duties, V.A.T. and other imposts which will be for the Buyer's account and should be added to the price as appropriate.

15) Intellectual Property

No representation, warranty or indemnity is given by the Seller that the products do not infringe any letters patent, trademarks, registered designs or other industrial rights.

16) Product Liability

16.1. The Buyer shall ensure that the products are transported, stored, fitted and used in accordance with any specifications or instructions which the Seller may provide.

16.2. The Buyer shall ensure that customers of the products incorporating the products shall be warned of the nature of the products and shall be given any information in respect of any claims made against the Seller where the Buyer has failed to comply with clause 16.1 above.

17) Assignability

The contract of which these conditions form part is personal to the Buyer and the benefit thereof shall not be assigned without the Seller's written consent.

18) Proper Law

These conditions and the contract between the parties shall be construed and applied in accordance with the Law of England and the English Courts shall have sole jurisdiction in any dispute relating thereto.

DST Group Ltd Reserves the right to alter / amend product data without prior notification







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