

Compressed Asbestos Gasket Sheets

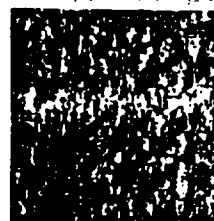
Technical Data

All data are typical values and refer to a sheet thickness of 1,6 mm (1/16")

PLAINTIFF'S EXHIBIT

UTX-55

KLINGERIT®
UNIVERSAL



KLINGERIT®



KLINGERIT
1000®

MAIN APPLICATIONS within the given pressure and temperature limits⁽¹⁾		Oil resistant material of highest quality. Asbestos fiber and NBR binder. Particularly suitable with stainless steel due to low chloride content. Outstanding oil and chemical resistance.	Top quality for general use. Asbestos fiber with SBR binder. Used on steam services or where conditions demand complete reliability at high temp. & pressures. Possesses excellent resistance to a wide range of chemicals, & organic compounds.	Top quality wire reinforced for extreme service. Asbestos fiber with SBR binder and close-mesh, mild steel wire. For conditions of fluctuating pressure and temp. Graphited both sides.
MAX. OPERATING Temperature CONDITIONS ⁽¹⁾ Pressure	°C bar (°F) (psi)	550 (1000) 140 (2000)	550 (1000) 130 (1800)	550 (1000) 200 (3000)
COMPRESSIBILITY ASTM F 36A RECOVERY ASTM F 36A	% %	7-17 55	7-17 55	7-17 50
HOT COMPRESSION TEST KLINGER ⁽²⁾ Thickness decrease 23°C (73°F) Thickness decrease 300°C (572°F)	% %	10 5	10 5	11 6
TENSILE STRENGTH ASTM F 152 across grain	N/mm² (psi)	42 (6000)	33 (4800)	35 (5000)
CHANGE IN TENSILE STRENGTH ASTM F 152 after immersion in ASTM-Oil 3, 5h 150°C (300°F)	%	-20	-40	-40
WEIGHT INCREASE ASTM F 146 after immersion in ASTM Fuel B: 5h 23°C (73°F)	%	10	12	12
THICKNESS INCREASE ASTM F 146 after immersion in ASTM Oil 1, 5h/150°C (300°F) ASTM Oil 3, 5h/150°C ASTM Fuel A, 5h/23°C (73°F) ASTM Fuel B, 5h/23°C	% % % %	2 8 7 12	10 20 8 15	6 20 7 15
DENSITY	grms/cc (lb./cu. ft)	1,95 (122)	1,85 (115)	2,15 (134)
STANDARD SHEET THICKNESS	inches	.008, 1/64, 1/32 3/64, 1/16, 3/32 1/8	.008, 1/64, 1/32 3/64, 1/16, 3/32 1/8, 1/4	.020, 1/32 3/64, 1/16, 1/8
SHEET SIZES	inches	60x60 60x180 60x45	60x60, 60x90 60x120, 60x180 60x45	60x60, 60x90 60x120 60x180 60x45

(1) (2) See notes on back-page

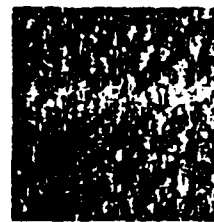
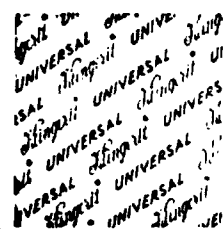
(3) At 25 N/mm², 300°C

(4) At 13 N/mm², 150°C

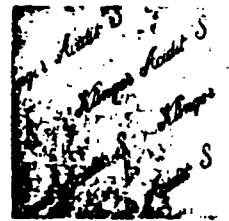
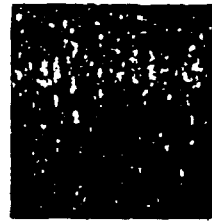
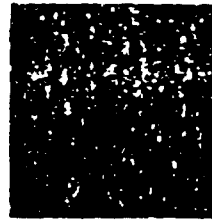
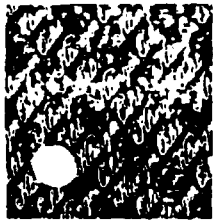
UTEX 001160

Technical Data

All data are typical values and refer to a sheet thickness of 1,6 mm (1/16")



UTEX 001161



KLINGER OILIT®	KLINGER R.K.	KLINGER K-61 1101	KLINGER K-51	KLINGER K-52	KLINGER ACIDIT-S®
Good quality oil and gasoline resistant sheet. Asbestos fiber with Nitrile binder. Widely used in the oil and petrochemical industries. Excellent resistance to oils and solvents, particularly suitable for use with refrigerants.	A navy grade sheet. Asbestos fiber with SBR binder. Similar to K-61 except recommended for more severe conditions. Makes excellent general service sheet. Listed on QPL - Spec. HH-P-46E.	General service sheet for moderate service conditions. Asbestos fiber with SBR binder. Good heat and aging resistance. Seals steam, water, air. Minimum gas permeability. Listed on QPL - Spec. HH-P-46E.	High quality sheet. Asbestos fiber with chloroprene (neoprene) binder. Good heat and aging resistance. Resists oils, freons, and petrochemicals. Similar to K-52 except recommended for more severe conditions.	Good quality sheet for moderate service conditions. Asbestos fiber with chloroprene (neoprene) binder. Good heat and aging resistance. Resists oils, freons, and petrochemicals.	High quality acid resistant material for use up to 300°F. Asbestos fiber with special acid resistant binder. Widely used in the chemical industry. Suitable for glass and ceramic flanges.
500 (935) 130 (1800)	430 (800) 35 (500)	400 (750) 28 (400)	400 (750) 28 (400)	400 (750) 28 (400)	150 (300) 20 (300)
7-17 55	7-17 55	7-17 55	7-17 55	7-17 55	7-17 45
9 5	8 (3) 3 (3)	8 (3) 5 (3)	9 (3) 5 (3)	9 (3) 5 (3)	6 (4) 6 (4)
29 (4200)	21 (3000)	18 (2600)	24 (3500)	19 (2800)	18 (2600)
-25	-45	-45	-45	-45	+20
8	10	15	15	15	5
— 6 3 8	10 25 7 15	12 30 12 20	— 25 8 15	— 25 8 15	(5) — 6 — 8
1.90 (119)	1.80 (112)	1.80 (112)	1.80 (112)	1.80 (112)	1.90 (119)
1/64, 1/32 1/16, 3/32 1/8	1/64, 1/32, 3/64 1/16, 3/32 1/8, 1/4	1/64, 1/32, 3/64 1/16, 3/32 1/8, 1/4	1/64, 1/32 1/16, 1/8	1/64, 1/32 1/16, 1/8	1/32, 1/16, 1/8
60x60, 60x90 60x120 60x180 60x45	60x60, 60x90 60x120, 60x180 60x45	60x60, 60x90 60x120, 60x180 60x45	60x60, 60x90 60x120, 60x180 60x45	60x60, 60x90 60x120, 60x180 60x45	60x80 60x160 60x40

(5) Acidit S: Typical thickness increase after acid immersion

96% Sulphuric acid	18 hours 20°C	(68°F): 6%
95% Nitric acid	18 hours 20°C	(68°F): 15%
50% Nitric acid	1 hour 65°C	(150°F): 12%

(6) 0.8 (1/32")

thickness material

TYPICAL PROPERTIES

	Normally Suggested Maximums		Compress- ability		Recovery %	Tensile Strength Across Grain	
	°F	(°C)	PSI	(bar)		PSI	(N/mm ²)
KLINGERIT	1000	(550)	1800	(130)	7-17	55	4800 (33)
KLINGERIT 1000	1000	(550)	3000	(200)	7-17	50	5000 (35)
KLINGERIT UNIVERSAL	1000	(550)	2000	(140)	7-17	55	6000 (42)
KLINGER K-61	750	(400)	400	(28)	7-17	55	2600 (18)
KLINGER RK	800	(430)	500	(35)	7-17	55	3000 (21)
KLINGER OILIT	935	(500)	1800	(130)	7-17	55	4200 (29)
KLINGER K-51	750	(400)	400	(28)	7-17	55	3500 (24)
KLINGER K-52	750	(400)	400	(28)	7-17	55	2800 (19)
KLINGER ACIDIT	300	(150)	300	(20)	7-17	45	2800 (18)
KLINGERSIL C-4400	750	(400)	1450	(100)	7-17	50	2200 (15)

U.S. SPECIFICATION COMPLIANCE

Specification	Grade/Class	Klinger Style No.
ASTMF104/SAEJ90b	P1161A	Klingerit, R.K.,
	P1151A	Klinger 61
	P1141A	Klinger 51
		Klinger 52
MIL-G-12803A	P1161A	Klingerit Universal
	P1151A	Klinger Oilit
	P1141A	Klinger 61
		Klinger 51
HH-P-46E (MIL-A-17472B)	1	Klinger 52
		Klinger Oilit
AMS 3232K	—	R.K. (Listed QPL)
MIL-A-7021C	1 & 2	Klingerit Universal
	2	Klinger 51, 52
		Klingerit, R.K.
		Klinger Oilit

Klinger materials also meet many European standards and are approved on many customer specifications around the world.

UTEX 001163

ASTM F104

Klingerit Universal	F112121 M8	Klinger 61	F112740 M6
Klingerit	F112551 M8	Klinger 51	F112440 M7
Klingerit 1000	F112551 M8	Klinger 52	F112440 M6
Klinger Oilit	F112130 M8	Klinger Acidit-S	F112000 M6
R.K.	F112750 M7	Klingersil	F002135 M6

CONDITIONS FOR USE

Klinger compressed asbestos sheet packing is manufactured from white (chrysotile) asbestos bonded with natural or synthetic rubber. In the manufacturing process the asbestos is encapsulated by the rubber, and no special precautions are required in the normal handling, storage or transportation of the sheet or gaskets produced from the sheet.

Special precautions are not required when conventional shearing, slitting or blanking methods are used in the production of gaskets. However, the material should not be drilled, ground, sawed, sanded or subjected to any other dust producing process without adequate dust extraction.

KLINGERSIL C-4400 - If C-4400 is subjected to any dust producing process, dust level should not exceed 10MG/M³ (nuisance dust).

Chemical Resistance Chart

The information in this chart should only be used as a general guide to the selection of a suitable material.

A = Suitable

B = Suitability depends on operating conditions

C = Not suitable

Solid materials shown are to be understood as aqueous solutions or suspensions.

KLINGERIT 1000,

Due to the special formulation it is only possible to predict performance for this material when all operating conditions are known. It has therefore been omitted from this chart. Please consult our Technical Services who will be pleased to advise on the most suitable grade for media not included in this chart.

Medium	KLINGERSIL	KLINGERIT	KLINGERIT UNIVERSAL	KLINGER K-51, K-52	KLINGER ACIDIT	KLINGER OILIT	KLINGER K-61, RK
Acetaldehyde	B	A	B	C	A	C	A
Acetic Acid 100%	A	A	A	A	A	A	A
Acetic Acid 10%	A	A	A	A	A	A	A
Acetic Ether	B	A	B	B	C	B	B
Acetone	B	A	B	B	C	B	A
Acetylene	A	A	A	A	B	A	A
Adipic Acid	A	A	A	A	A	A	A
Air	A	A	A	A	A	A	A
Alum.	A	A	A	A	A	A	A
Aluminum Acetate	A	A	A	A	A	A	A
Aluminum Chloride	A	A	A	A	A	A	A
Ammonia	A	A	A	A	A	A	A
Ammonium Bicarbonate	A	A	A	A	A	A	A
Ammonium Chloride	A	A	A	A	A	A	A
Ammonium Diphosphate	A	A	A	A	A	A	A
Ammonium Hydroxide	A	A	A	A	A	A	A
Amyl Acetate	B	A	C	C	B	C	B
Aniline	C	B	A	A	B	A	C
Aviation Fuels	A	B	A	A	B	A	C
Barium Chloride	A	A	A	A	A	A	A
Benzene	A	B	A	A	B	A	C
Benzoic Acid	B	A	A	A	A	A	A
Bleach Solutions	A	A	A	A	A	A	A
Boiler Feed Water	A	A	A	A	B	A	B
Borax	A	A	A	A	A	A	A
Boric Acid	A	B	A	A	A	A	C
Butane	A	B	A	B	C	B	B
Butanone (M E K)	B	A	A	B	C	B	B
Butyl Acetate	B	A	A	A	A	A	A
Butyl Alcohol (Butanol)	A	A	A	A	A	A	A
Butyric Acid	A	A	A	A	A	A	A
Calcium Chloride	A	A	A	A	A	A	A
Calcium Hydroxide	A	A	A	A	A	A	A
Calcium Hypochlorite	A	A	A	A	A	A	A
Carbon Dioxide	A	A	A	A	A	A	A
Carbon Disulphide	C	C	A	B	C	A	C
Carbon Tetrachloride	B	B	A	B	B	B	C
Castor Oil	A	A	A	A	A	A	B
Chlorine (Dry)	B	B	B	B	B	B	C
Chlorine (Wet)	B	B	B	B	B	B	C
Chloroform	B	B	B	B	B	B	C
Chromic Acid	B	C	B	B	A	B	C
Citric Acid	A	A	A	A	A	A	A
Clophen T 64	B	C	A	A	B	A	C
Condensate	A	A	A	A	B	A	C
Copper Sulphate	A	B	B	C	C	C	B
Creosote	C	B	B	C	C	C	B
Cresol	B	A	B	B	A	B	B
Cyclohexanol	A	A	A	A	C	A	B
Decalin	A	B	A	B	B	C	C
Dibenzylether	C	A	B	C	B	C	C
Diethylphthalate	A	A	A	A	B	A	C
Diesel Oil	A	B	A	A	B	A	C
Dimethylformamide	C	A	C	B	C	C	B
Diphenyl Dowtherm A	A	C	A	B	C	A	C
Dye Liquors (alkaline, neutral, acid)	A	A	A	A	A	A	A
Ethane	A	A	A	A	A	A	A
Ethyl Acetate	B	A	A	A	B	B	B
Ethyl Alcohol Ethanol	A	A	A	A	A	A	A
Ethyl Chloride	B	C	B	B	C	B	C
Ethylene	A	A	A	A	B	A	A
Ethylene Chloride	C	A	B	B	C	C	B
Ethylene Glycol	A	A	A	A	A	A	A
Ethyl Ether	A	A	A	A	A	A	A
Freon 12	A	B	A	A	C	A	C
Freon 22	B	C	B	A	C	B	C
Formaldehyde	A	A	A	A	A	A	A
Formic Acid 10%	A	A	A	A	A	B	B
Formic Acid 85%	B	A	A	A	A	A	B
Glycerine	A	A	A	A	A	A	A
Heating Oil	A	B	A	A	B	A	C
Heptane	A	B	A	A	A	A	C
Hydraulic Oil (Glycol Based)	A	A	A	A	A	A	A
Hydraulic Oil (Mineral)	A	B	A	A	B	A	C
Hydraulic Oil (Phosphate Ester Based)	B	A	B	B	C	B	B
Hydrochloric Acid 20%	B	B	B	B	A	B	C
Hydrochloric Acid 37%	C	B	B	B	A	C	C
Hydrofluoric Acid 10%	C	C	C	C	B	C	C
Hydrofluoric Acid 40%	C	C	C	C	B	C	C
Hydrogen	A	A	A	A	A	A	A
Hydrogen Peroxide (up to 6% w/w)	A	A	A	A	A	A	A
Hydrogen Chloride (Dry)	A	A	A	A	A	A	A
Medium	KLINGERSIL	KLINGERIT	KLINGERIT UNIVERSAL	KLINGER K-51, K-52	KLINGER ACIDIT	KLINGER OILIT	KLINGER K-61, RK
iso-octane	A	A	A	A	A	A	B
iso-propyl Alcohol	A	A	A	A	A	A	A
Kerosene	A	B	A	A	A	A	C
Lactic Acid 50%	A	A	A	A	A	A	A
Linseed Oil	A	A	A	A	A	A	B
Magnesium Sulphate	A	A	A	A	A	A	A
Malic Acid	A	A	A	A	A	A	A
Methane	A	A	A	A	A	A	A
Methyl Alcohol	B	C	B	B	C	B	C
Methyl Chloride	C	B	C	C	C	C	C
Methylene Chloride	C	B	C	C	C	C	C
Methyl Ethyl Ketone	B	A	B	B	C	B	B
Mineral Oil	A	B	A	A	A	A	C
Mineral Oil Type ASTM 1	A	B	A	A	A	A	C
Mineral Oil Type ASTM III	B	C	B	B	C	B	C
Monochlor Methane	B	C	B	B	C	B	C
Nitrogen	A	A	A	A	A	A	A
Naphtha	A	B	A	A	B	A	C
Nitric Acid 20%	C	B	B	B	A	C	C
Nitric Acid 40%	C	C	C	C	A	C	C
Nitric Acid 96%	C	C	C	C	A	C	C
Octane	A	B	A	A	A	A	C
Oleic Acid	B	B	B	B	A	B	C
Oxalic Acid	B	B	B	B	A	B	C
Palmitic Acid	A	B	A	A	A	A	B
Pentane	A	B	A	A	A	A	C
Perchloroethylene	B	B	B	B	B	B	C
Petroleum	A	B	A	A	A	A	C
Petroleum Ether	A	A	A	A	A	A	B
Phenol	C	A	B	B	A	B	B
Phosphoric Acid (all concentrations)	A	A	A	A	A	A	B
Phthalic Acid	A	A	A	A	B	A	A
Potassium Acetate	A	A	A	A	A	A	A
Potassium Carbonate	A	A	A	A	A	A	A
Potassium Chlorate	A	A	A	A	A	A	A
Potassium Chloride	A	A	A	A	A	A	A
Potassium Cyanide	A	A	A	A	A	A	A
Potassium Dichromate	A	A	A	A	A	A	A
Potassium Hydroxide	B	A	A	A	A	A	B
Potassium Hypochlorite	A	A	A	A	A	A	A
Potassium Nitrate	A	A	A	A	A	A	A
Potassium Permanganate	A	A	A	A	A	A	A
Producer Gas	A	A	A	A	A	A	A
Propane	A	A	A	A	A	A	A
Pyridine	C	C	C	C	C	C	B
Rape Seed Oil	A	A	A	A	A	A	B
Silicone Oil	A	A	A	A	A	A	A
Sea Water	A	A	A	A	A	A	A
Sodium Aluminate	A	A	A	A	A	A	A
Sodium Bicarbonate	A	A	A	A	A	A	A
Sodium Bisulphite	A	A	A	A	A	A	A
Sodium Chloride	B	A	A	A	A	A	A
Sodium Hydroxide	A	A	A	A	A	A	B
Sodium Silicate	A	A	A	A	A	A	A
Sodium Sulphate	A	A	A	A	A	A	A
Sodium Sulphide	A	A	A	A	A	A	A
Steam	A	A	A	A	A	A	A
Stearic Acid	A	A	A	A	A	A	B
Sulphur Dioxide	C	B	B	B	A	B	C
Sulphuric Acid 20%	C	B	B	B	A	C	C
Sulphuric Acid 50%	C	B	B	B	A	C	C
Sulphuric Acid 96%	B	B	B	B	A	B	C
Sulphurous Acid	B	B	B	B	A	B	C
Tannic Acid	A	A	A	A	A	A	A
Tartaric Acid	A	A	A	A	A	A	A
Tetrachlorethane	B	B	B	B	C	B	C
Tetrahn	A	B	A	A	A	A	C
Toluene	A	B	A	A	A	A	C
Town Gas	A	A	A	A	A	A	B
Transformer Oil	A	B	A	A	A	B	B
Trichlor Ethylene	A	B	A	A	A	A	C
Turpentine	A	B	A	A	A	A	C
Vinyl Acetate	A	B	A	A	C	A	C
Water	A	A	A	A	A	A	A
White Spirit	A	B	A	A	A	A	C
Xylene	A	B	A	A	B	A	C

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Notes:

(1) Temperature

The temperature up to which a gasket functions satisfactorily depends on the service medium, pressure and flange loading. The values shown should therefore be regarded as maximum.

Klinger gasket materials have no lower temperature limitation, but the following points should be observed with low temperature applications:

1. The gasket must be completely dry when installed. Gaskets should be stored in a dry atmosphere since the fibers absorb moisture from the air.
2. The gasket should not be subjected to severe thermal expansions at the joint assembly.
3. The required flange loading must be applied at ambient temperature and must not fall below the required minimum value over the whole range of service temperature.

(1) Pressure:

The values shown are given for guidance only. It is not possible to give a precise figure for the permissible service pressure or to specify the relationship between working pressure and temperature, since this does not depend only on the gasket material but to a great extent on the assembly conditions. The following factors are of great influence: type of flange (e.g. flat flanges, spigot and recess, tongue and groove), loading of the gasket in the assembly and at working pressure, quality of mating surfaces and nature of service medium. The pressure limitations shown may be lower for large gaskets or gaskets of thicknesses exceeding 1/8" (3mm). Higher internal pressures are possible with fully contained gaskets with suitable assembly conditions.

Too high a gasket surface stress can cause leakage. This is because the gasket loses the resilience needed to maintain its pressure against the flange surfaces. The loading on the gasket must never exceed the recommended maximum. For a given material, the maximum permissible loading depends mainly on the temperature and the thickness. Thin materials withstand higher stresses than thick ones: cold conditions permit higher stresses than hot. (i.e. Klingerit 1/64" cold 28,000 psi - 572°F 20,000 psi; 1/8" cold 8,500 psi - 572°F 5,500 psi). If the area enclosed by the gasket is large, the hydrostatic end thrust may be very large even at moderate internal pressure. This demands a correspondingly high bolt loading and the calculated minimum assembly stress (= bolt load/area of gasket) may exceed the permissible maximum for the given gasket thickness.

There are three possible remedies:

1. Use a larger gasket. This is only possible when the gasket dimensions are not already fixed (e.g. by pipeline flange specifications such as ANSI, DIN, BS, etc.).
2. Use a thinner material (and correspondingly better flange finish).
3. Use a material that withstands a higher loading e.g. wire-reinforced (Klingerit 1000).

(2) Hot Compression Test (Klinger apparatus)

This test was developed by Klinger to assess the behavior of gaskets when subjected to surface stress in cold and hot conditions.

In contrast with the ASTM F38 B test, the load is steadily maintained as the gasket relaxes and the temperature is increased. This means that Klinger test subjects the gaskets to much more severe conditions.

Measurements are made of the decrease in thickness under a load of 50 N/mm² (7250 psi) at a temperature of 23°C (73°F) and also the additional decrease in thickness caused by heating to 300°C (572°F) under constant load.

The sum of the two values gives the total decrease in thickness.

WHY KLINGER

Klinger is today - as it always has been - the world's leading manufacturer of compressed asbestos sheet packing, and the Klinger range covers every service and condition for which compressed asbestos may be used. Klinger materials are made to all major standards and are consequently used world-wide and in every branch of industry. The name "Klingerit", the original Klinger material, is known (and imitated) internationally and is frequently used as a synonym for compressed asbestos. For those customers who wish to eliminate asbestos from their product/plant, Klingsil C-4400 can be a viable alternative.

STANDARD WARRANTY

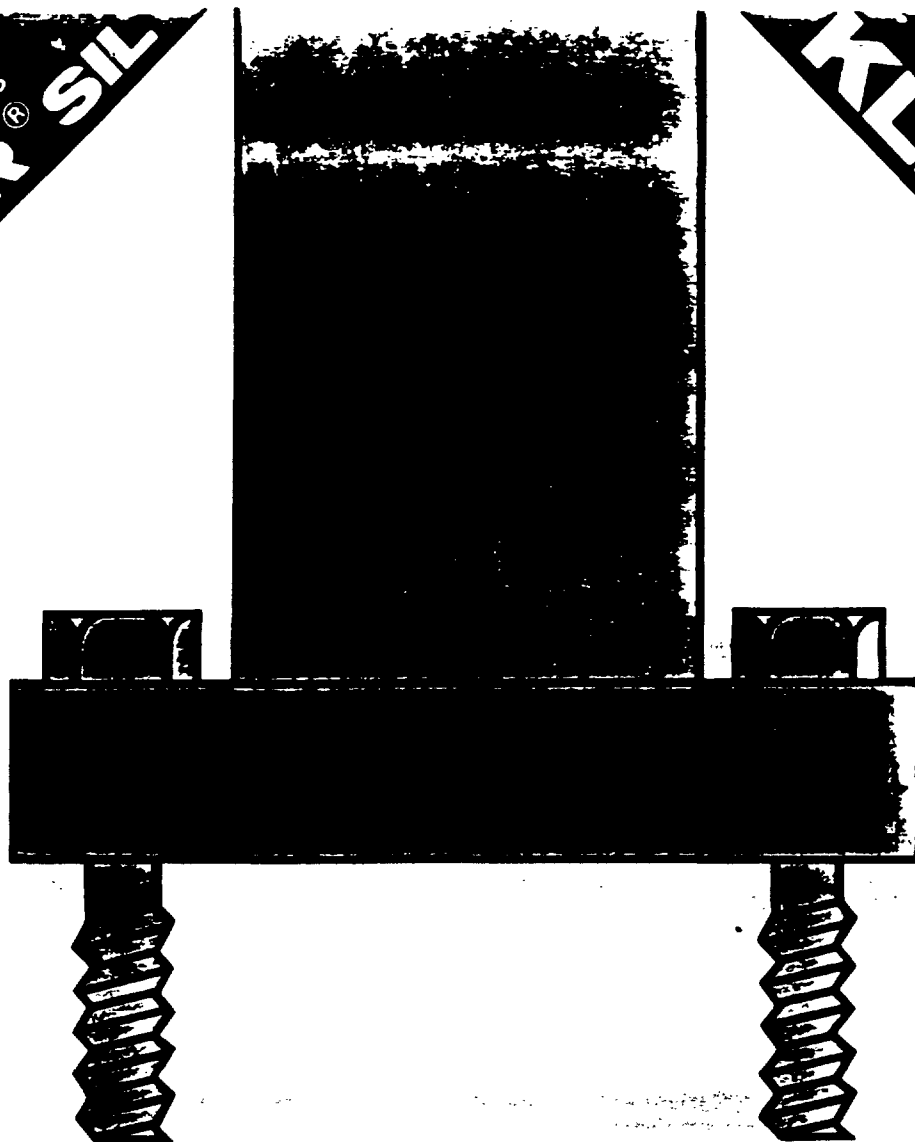
GOODS SOLD ARE WARRANTED TO BE FREE FROM DEFECT IN MATERIAL AND WORKMANSHIP, ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY THAT THE GOODS SHALL BE FIT FOR A PARTICULAR PURPOSE, ARE HEREBY EXCLUDED UNLESS SPECIFICALLY SET FORTH HEREUNDER. DEFECTIVE GOODS MAY BE RETURNED TO THE COMPANY AFTER INSPECTION BY THE COMPANY AND UPON RECEIPT OF DEFINITE INSTRUCTION FROM THE COMPANY.

GOODS SO RETURNED AND FOUND TO BE DEFECTIVE WILL BE REPLACED WITHOUT CHARGE, BUT THE SUPPLIER SHALL NOT BE LIABLE TO THE CUSTOMER OR ANY OTHER PERSON FOR LOSS OR DAMAGE DIRECTLY OR INDIRECTLY ARISING FROM THE USE OF THE GOODS, FROM BREACH OF ANY WARRANTY OR FROM ANY OTHER CAUSE, THE EXCLUSIVE REMEDY AGAINST THE SUPPLIER BEING TO REQUIRE REPLACEMENT OR AT THE SUPPLIER'S OPTION REPAIR OF DEFECTIVE GOODS. EVERY CLAIM ON ACCOUNT OF DEFECTIVE GOODS, SHORT COUNT, OR FOR ANY OTHER CAUSE, SHALL BE DEEMED WAIVED BY THE CUSTOMER UNLESS MADE IN WRITING WITHIN THIRTY (30) DAYS FROM THE DATE OF RECEIPT OF GOODS TO WHICH SUCH CLAIM RELATES.

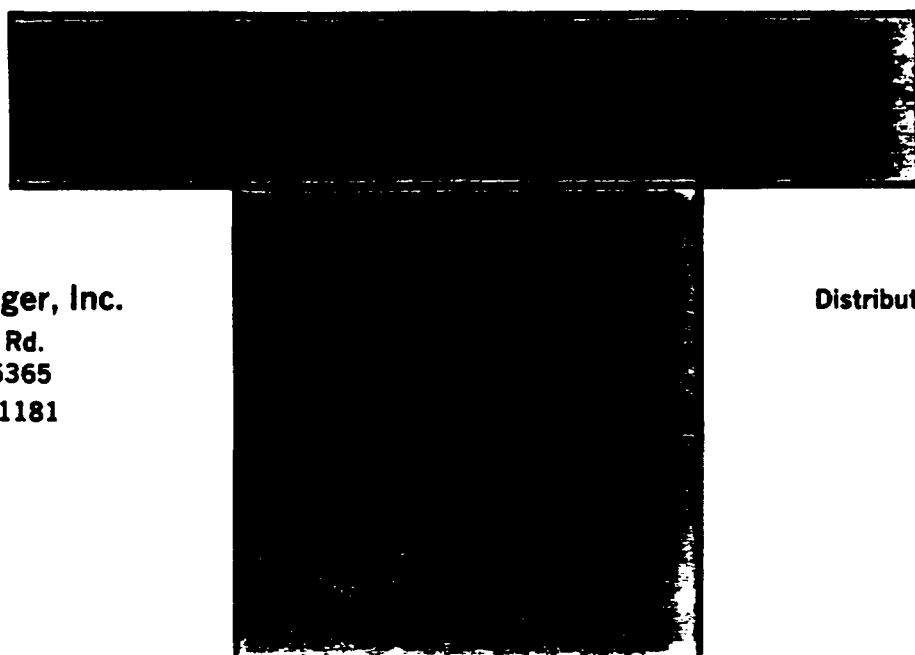
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