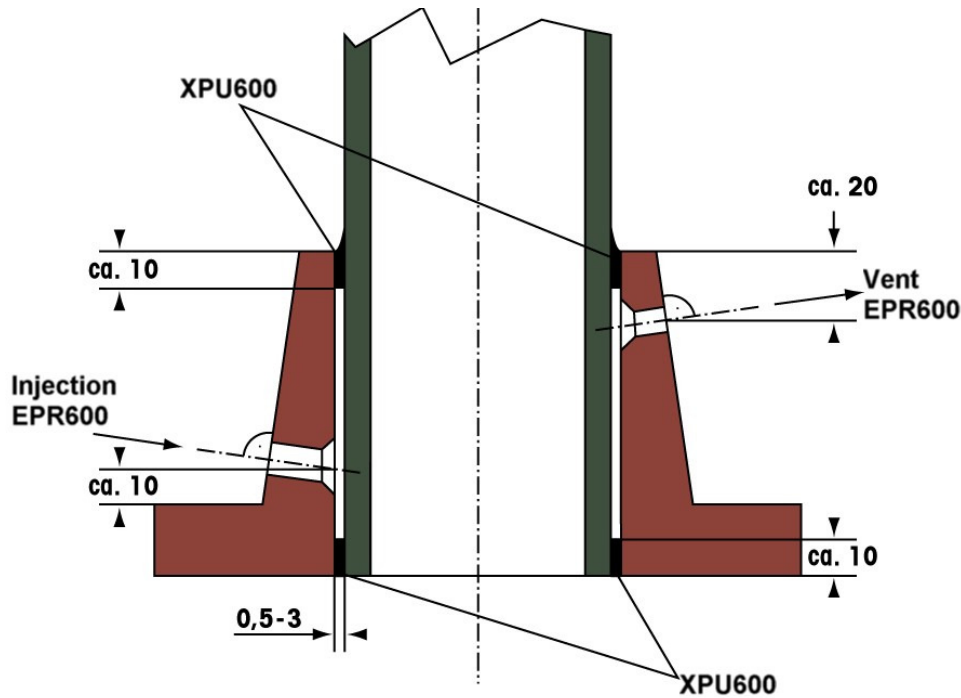


Rotec flange bonding, two component adhesive system

Note!
This system is to be used with type A Fixed and Stub Flanges only.

Rotec Adhesive Injection System



Location of drillings for gluing flanges

The Rotec Injection Adhesive System for bonding of Rotec type A Fixed and Stub Flanges

It is preferable to use Rotec adhesives and the Rotec injection adhesive system when bonding Rotec type A Fixed and Stub Flanges to composite pipes. Rotec adhesives give excellent results, are easy to use, have consistent performance and require limited times to bond.

The two component adhesive systems with 1:1 mixing ratios are packed in “coaxial double cartridges” with 600 ml capacity. The cartridges have two separate cylinders in order to keep the two components apart. Using a pneumatic pistol the two components are forced out of the cartridge in the correct proportions and are subsequently mixed to a homogeneous form by the static mixer. Attention should be paid to obtain a sufficiently high outflow speed, otherwise the correct mixture of the two components will not be achieved and the bond may fail or leak.

Adhesives

XPU600, URETHANE

A corrosion resistant 2-component Urethane adhesive with high resistance to moisture and chemicals. It has a high viscosity, is quick to cure, and is cream in color.

EPR600, EPOXY

A corrosion resistant 2-component Epoxy adhesive with high resistance to moisture and chemicals. It has a low viscosity, is slow to cure, and is transparent.

Rotec flange bonding, two component adhesive system

The Rotec Injection Adhesive System requires the use of both types of adhesive for bonding of flanges to pipe. The XPU600 adhesive is used to seal off the space between pipe and flange, and the EPR600 EPOXY adhesive, which ensures the long term bond strength, is then injected into the enclosed space between flange and pipe.

Resistance to chemicals

The environmental conditions to which the adhesive is exposed may be the main factor concerning an eventual deterioration of the performance of the adhesive. The effect of chemical attack may be detrimental to the long term bond strength. For this reason it is very important to select the right type of adhesive to be used. After complete hardening the XPU600 adhesive has a good long term resistance to water, sea water and very diluted acids and alkalis. Any exposure to concentrated acids or alkalis must be very limited as to the duration of exposure. The resistance to detergents, hydrocarbons, mineral oils, chlorinated solvents and strongly oxidizing acids such as nitric or sulfuric acids is very low when exposed permanently.

Bonding Rotec flanges

1 The bonding surface of the pipe should be sanded or sand blasted. Both surfaces (flange and pipe) should be free of moisture, dust and grease. Drill an injection hole, diameter 7.0 mm, and a venting hole, diameter 7.0 mm in the flange as shown on the above drawing. Countersink the injection and venting holes on the inside of the flange to assure better flow.

2 Position the pipe and then slide the flange into position. Secure both in such a manner that the gap between pipe and flange (between 0.5 and 3.0 mm depending upon the diameter) is uniformly distributed. The pipe and flanges can be bonded in either the vertical or horizontal position. In both cases the adhesive should be injected in the lower position, with the aeration hole on the upper side.

3 VITAL STEP! Using the XPU600 with the adhesive pistol and a static mixer, close off both gaps with air tight seals. Smooth out the adhesive (with index finger) so that the adhesive is pushed into the gap to a depth of approximately 1 cm.

Important considerations:

- Adhesive (cartridge) temperature must be between 20°C and 35°C.
- Be sure to inject the adhesive INTO the gap.
- If the procedure is interrupted, leakage can occur at the point of interruption.
- Each time a new adhesive cartridge is used, discard the initial amount of adhesive extruded. Use the adhesive once the components have been homogeneously mixed, when there is no air

entrapped in the mix, and when the adhesive has an even color.

- Curing at 20°C will take about 10 minutes.
- Check to make certain that the adhesive seals are closed and properly cured.
- Place a 25 cm length of 8mm diameter tubing in the venting hole

4 Once the XPU600 adhesive has cured completely, inject the EPR600 EPOXY adhesive, using the adhesive pistol and a NEW static mixer. Push the outflow opening of the static mixer into the injection hole. As for the XPU adhesive do not use the initial portion of adhesive from a new adhesive cartridge. Always take care that the venting is adequate and that the air pressure is high enough. When the adhesive starts to come out of the venting tube, maintain the pressure for some time and continue the injection process until no more air escapes from the venting tube (the time required varies with the diameter). The pressure during this process is approximately 5 bar. Always use safety glasses!

Attention:

- When bonding large flanges (above 1000 mm diameter) drill 3 vent holes at a distance of 30 cms from each other.
- If the gap between flange and pipe is less than 2 mm, grind off the end of the pipe (approx 3 mm) at an angle of 45° in order that a wider gap is created
- If the flange and/or the pipe is cold (< 20°C) first heat them to over 20°C.
- If the adhesive is cold (< 20°C) first bring the required quantity of adhesive to a temperature

Rotec flange bonding, two component adhesive system

- above 25°C preferably around 30°C, by placing it in warm water (approx 35°C).
- At lower temperatures (< 20°C) the viscosity of epoxy adhesive in particular can increase significantly, becoming too thick, which can result in problems during injection.
 - At higher temperatures, the pot life (the time when the adhesive remains workable) will decrease.

5 Remove the static mixer from the injection hole and quickly and completely close off this hole (with for example, an M8 bolt or a wooden plug). Close off the vent hole or holes by kinking the tubes and securing them with tape (do not remove the tubes).

All excessive adhesive must be removed from the outside of the flange within thirty minutes as it is extremely difficult to remove once it has hardened. Heating is not necessary as the adhesive will be fully cured after 48hrs without heating. The period of time possible to work with the adhesive after mixing (open time) is approximately 75 minutes at 20°C. Further information concerning service life against temperature is included in the data in each box of adhesive. The minimum temperature for application is 20°C.

6 Clean off the flange surface.

7 Bonding is now complete.

Caution

**WHEN WORKING WITH ADHESIVES AND/OR RESINS ALWAYS FOLLOW THE RECCOMENDATIONS PROVIDED IN THE SAFETY INFORMATION SHEETS!
ALWAYS WEAR SAFETY GLASSES AND GLOVES!**

Handling and storage

Keep the product in a tightly sealed package. Avoid contact with skin and eyes. After any skin contact wash thoroughly with soap and water. In case of contact with eyes, rinse immediately with copious amounts for 15 minutes whilst at the same time seeking medical advice. Keep out of reach of children, and keep away from heat, ignition devices, sparks and open flames.

Mixing and application

The preferred method of application for XPU600 and EPR600 is with the aid of a pneumatic adhesive pistol and a static mixing tube. To assure maximum bond strength, the adhesive should be applied within the indicated time (assembly time)

Use sufficient material as required to insure that the adhesive seam is completely filled. Any moving of the bonded parts after the assembly time has elapsed and before the fixation time has been achieved can result in reduced bonding strength.

Avoid adhesive film thickness in excess of 4mm between the pipe and the flange.

Storage and storage life

Keep in a cool dry place. The XPU adhesive can be kept for a maximum of 6 months if stored in the original unopened package at a temperature of 15-20°C. The epoxy adhesive can be kept for a maximum of 12 months if stored in the original unopened package at a temperature of 15-20°C.

Important

Use a "first in - first out" system in order that the oldest material will always be used first.

Supply and properties of the adhesives and associated tools

Using Rotec bonding systems, two adhesive materials are required on each bonded connection. First of all a quick setting urethane system which allows service temperatures from -40 to +100°C, with a curing time of 2

Rotec flange bonding, two component adhesive system

hrs at 25°C and secondly, an epoxy system for service temperatures from -40 to +60°C, with a curing time of 72 hrs at 25°C. Should the installer/client opt for alternative systems he should consider other factors such as pot life, tensile strength and elongation when selecting an adhesive system. Please see below for detailed information concerning both systems proposed by Rotec.

The material proposed by Rotec can be summarized as follows:

Article	Article number
Urethane adhesive 600 ml in co-axial cartridges	XPU600
Epoxy adhesive 600 ml in co-axial cartridges	EPR600
Pneumatic adhesive pistol	APA680

The quantities of adhesives required per joint varies with the diameter and pressure rating of the flange. Based upon an average gap of 1.5 mm between the pipe and the flange the number of cartridges per joint can be estimated as follows.

Article	PU cartridges XPU600 (no./product)	Epoxy cartridges EPR600 (no./product)	Article	XPU cartridges XPU600 (no./product)	Epoxy cartridges EPR600 (no./product)
SF/FF-150-10	0,09	0,20	SF/FF-800-3	0,52	2,16
SF/FF-150-16	0,09	0,26	SF/FF-800-10	0,52	2,61
SF/FF-200-10	0,12	0,32	SF/FF-800-16	0,52	3,05
SF/FF-200-16	0,12	0,38	SF/FF-900-3	0,58	2,52
SF/FF-250-10	0,14	0,41	SF/FF-900-6	0,58	2,85
SF/FF-250-16	0,14	0,49	SF/FF-900-10	0,58	3,27
SF/FF-300-10	0,17	0,53	SF/FF-1000-3	0,65	2,98
SF/FF-300-16	0,17	0,64	SF/FF-1000-6	0,65	3,35
SF/FF-350-10	0,20	0,64	SF/FF-1000-10	0,65	3,81
SF/FF-350-16	0,20	0,78	SF/FF-1100-3	0,72	3,11
SF/FF-400-10	0,23	0,82	SF/FF-1100-6	0,72	3,53
SF/FF-400-16	0,23	0,97	SF/FF-1100-10	0,72	4,05
SF/FF-450-10	0,25	1,00	SF/FF-1200-3	0,77	3,55
SF/FF-450-16	0,25	1,17	SF/FF-1200-6	0,77	4,00
SF/FF-500-3	0,28	0,96	SF/FF-1200-10	0,77	4,55
SF/FF-500-10	0,28	1,15	SF/FF-1400-3	0,91	4,71
SF/FF-500-16	0,28	1,39	SF/FF-1400-6	0,91	5,24
SF/FF-600-3	0,32	1,29	SF/FF-1400-10	0,91	6,15
SF/FF-600-10	0,32	1,51	SF/FF-1600-3	1,04	5,96
SF/FF-600-16	0,32	1,79	SF/FF-1600-6	1,04	6,55
SF/FF-630-3	0,33	1,32	SF/FF-1600-10	1,04	7,75
SF/FF-630-10	0,33	1,55	SF/FF-1800-3	1,55	7,52
SF/FF-630-16	0,33	1,83	SF/FF-1800-6	1,55	8,35
SF/FF-700-3	0,45	1,69	SF/FF-1800-10	1,55	9,69

Note: these quantities are approximate and are given as a guide only.

Rotec flange bonding, two component adhesive system

Rotec two component urethane adhesive cartridge **XPU600**

Physical properties			
	Unit	Polyol - component A	Isocyanate - component B
Viscosity	mPas	20000	10000
Density	kg/m ³	1050	1140
Flame point	°C	>150	>140
Mixing proportions	by weight	100	108
Mixing proportions	by volume	100	100

Description of cartridge

XPU600 is packaged in 600ml cartridges and requires the use of a pneumatic pistol. The adhesive is available in boxes containing 12 cartridges of 600ml.

Precautions

We advise that the product be used only at temperatures between +20 and +35°C. Normal health and safety precautions should be followed when handling these products. Ensure good ventilation, wear gloves and safety glasses. For further information please consult the product safety data sheet included in each cartridge.

Storage and preservation.

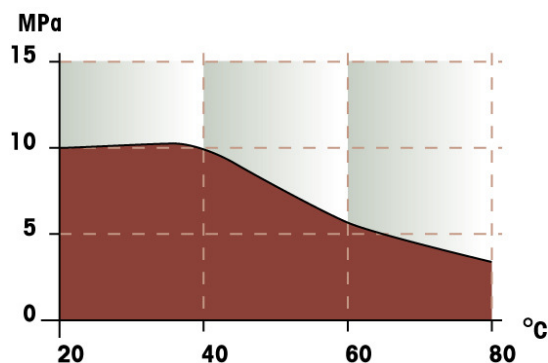
The shelf life of XPU600 is at least 6 months in its original unopened packaging and at a temperature between +15°C and +20°C.

Mechanical properties of bond ⁽¹⁾			
Lap shear strength etched in a sulfochromic bath	ISO 4587-95	Mpa	14
Climbing drum peel strength	ISO 4578-90	kN/m	9
Lap shear strength after moist cataplast at 80°C ⁽²⁾	ISO 4587-95	Mpa	8
Peel strength after 14 days immersion in water at 80°C	ISO 4578-90	kN/m	3.2

⁽¹⁾ Conditions of hardening: 8 hrs at 80°C + 48 hrs at room temperature

⁽²⁾ Moist cataplast: 14 days

Lap shear strength versus temperature



Rotec flange bonding, two component adhesive system

Rotec two component epoxy adhesive cartridge **EPR600**

Rotec two component unfilled epoxy adhesive cartridge EPR600 offers flexibility and confers a good vibration and shock resistance to the bond. It has an open processing time of 75 minutes and can be used and hardened at temperatures between 20 and 30°C.

EPR600 is an epoxy resin (A-component) with an amine hardener (B-component).

Physical properties			
	Unit	A-component	B-component
Viscosity	mPas	paste	paste
Density	kg/m ³	1220	
Flammability	°C	>150	>140
Mixing proportions	by weight	100	86.5
Mixing proportions	by volume	100	100

Properties at 23°C.

	Unit	Value	Standard
Processing time	minutes	75	
Apparent strength	hours	12	
Full strength (23°C)	hours	48	
Full strength (70°C)	hours	4	
Full strength (100°C)	hours	1	
Push off strength	N/mm ²	22	DIN 53283
Pull strength	N/mm ²	49	DIN 53455-5-4
Elasticity	%	11	DIN 53455-5-4

Properties at 23°C.

Description of cartridge

EPR600 is packaged in 600ml cartridges and requires the use of a pneumatic pistol. The adhesive is available in boxes containing 12 cartridges of 600ml.

Precautions

We advise that the product be used only at temperatures between + 20 and + 35°C. Normal health and safety precautions should be followed when handling these products. Ensure good ventilation, wear gloves and safety glasses. For further information please consult the product safety data sheet included in each cartridge.

Storage and preservation.

The shelf life of EPR600 is at least 12 months in its original unopened packaging and at a temperature between + 15°C and + 20°C. After a period of 3 months some crystallization of the A-component can occur. If this happens it is recommended to heat up the cartridge at 40°C for 16 hours.

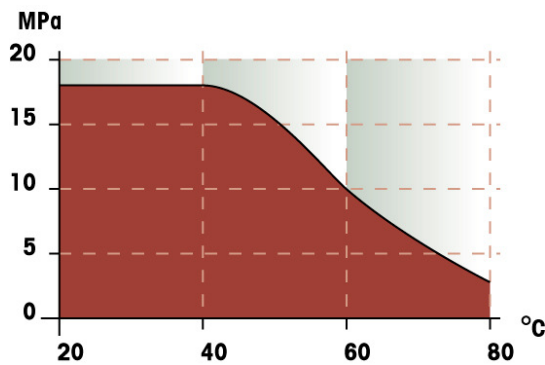
Rotec flange bonding, two component adhesive system

Mechanical properties of bond ⁽¹⁾			
Lap shear strength etched in a sulfochromic bath	ISO 4587-95	Mpa	18
Climbing drum peel strength	ISO 4578-90	kN/m	3.6
Lap shear strength after moist cataplast at 80°C ⁽²⁾	ISO 4587-95	Mpa	14
Peel strength after 14 days immersion in water at 80°C	ISO 4578-90	kN/m	2

⁽¹⁾ Conditions of hardening: 8hrs at 80°C + 48 hrs at room temperature

⁽²⁾ Moist cataplast: 14 days

Lap shear strength versus temperature



Definitions

OPEN TIME

The maximum time allowed for the application of the adhesive and jointing of parts during which the adhesive surface remains sticky.

ASSEMBLY TIME

The maximum time available, after initially joining the parts, during which the parts can be repositioned. After this time interval has elapsed the parts should no longer be moved, repositioned or subjected to any stress until full hardening of adhesives are complete.

FIXATION TIME

The time interval after which an adhesive joint of a width of 25.4mm and an overlap of 12.7mm is capable of bearing a weight of 1 kg.

Limitations of warranty.

All information in this document is based upon laboratory tests and the current state of our knowledge.

In spite of the greatest care that we have taken, we can accept no liability for the results achieved considering that the design, processing, application, storage methods etc are beyond our control. It is advisable to carry out a test application for the intended application for all above mentioned products.

Neither the manufacturer or his representative and/or distributors accept any liability for advice proffered and/or other services provided in any form, nor for the properties nor performance of these products including any damage, direct or indirect, resulting from the use of these products. Responsibility for the use of these products as well as protection of property and individuals is solely that of the purchaser and/or end user. Supply and properties of the adhesives and associated tools.