MANUAL

PUR hot melt adhesives

Important information for users of moisture-curing polyurethane hot melt adhesives

- Instructions for processing **Jowatherm-Reaktant®**
- Instructions for cleaning and maintenance
  - Cartridge units
  - Squeezeout units for bags, premelters for cylinders
  - Bulk melters (tank units)
  - Drum melters
  - Slot nozzles and application heads
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  - Disposal of residues (adhesive, flushing and cleaning agents)
  - Recycling of packaging material
- **Jowat®** Flushing Agent and **Jowat®** Cleaning Agent for PUR hot melt
  - Product compilation flushing and cleaning agents

First class bonding

Jowat Klebstoffe

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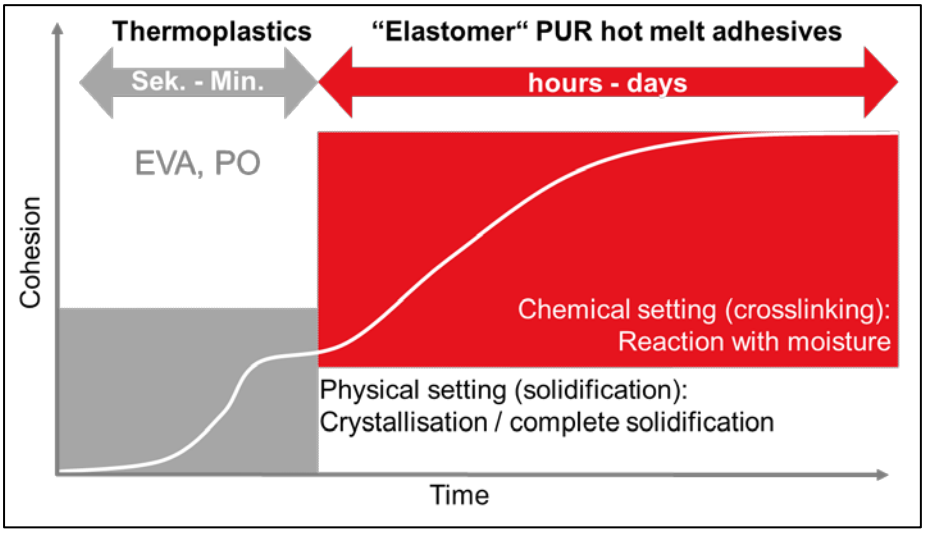
1. Instructions for processing **Jowatherm-Reaktant®**

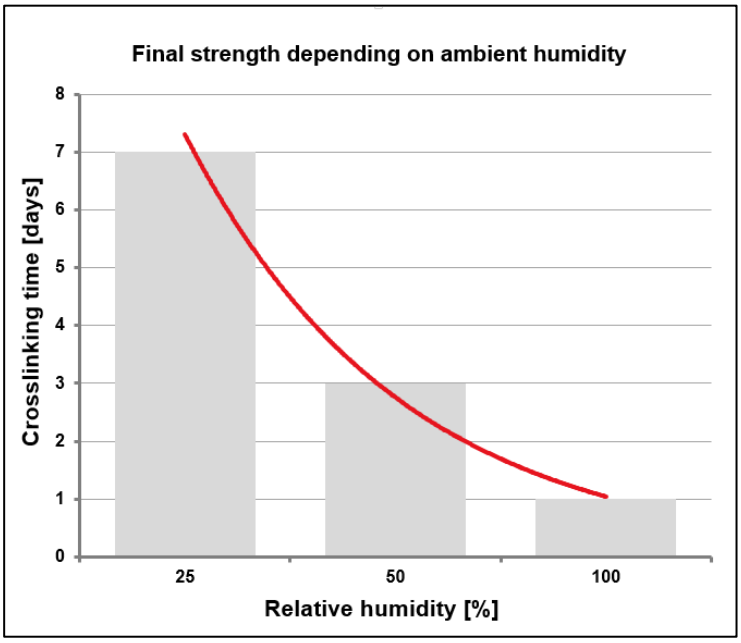
1.1 Properties

One-component polyurethane hot melt adhesives (PUR) are characterised by the fact that after the purely physical setting where the material solidifies, a subsequent reaction with humidity occurs which triggers chemical crosslinking.



The areas of application for the polyurethane hot melt adhesives are therefore clear: Wherever the end product has to meet high standards of water and heat resistance, they are the products of choice. The chemical reaction with the adherends also leads to major advantages with regard to the adhesion spectrum. No other hot melt adhesive has such a superior adhesive performance on the most diverse materials when compared to the polyurethane hot melts.

During crosslinking, very minor amounts of CO_2 gas develop which largely evaporate from the adhesive film. This minor amount of CO_2 gas is normally not visible for the human eye at room temperature. If, however, non-porous substrates (for instance profiles or sheet material of PVC or aluminium with relatively thick plastic foils or similar) are bonded, testing at higher temperatures may result in expansion of these gas inclusions, weakening the adhesive bondline. This phenomenon depends mainly on the application amount/thickness of the adhesive layer which is to be examined and possibly reduced. If this step does not have the desired effect, the adhesive manufacturer should be contacted, since there might be alternative products with less CO_2 gas formation.



The crosslinking is caused by humidity in the air, and/or moisture contained in the materials to be bonded. Accordingly, the PUR hot melt adhesives have to be protected from any contact with humidity during manufacture, storage and processing, to avoid premature reaction.

The diagram above shows the dependency of the crosslinking time on the available relative humidity.

1.2 Packaging units

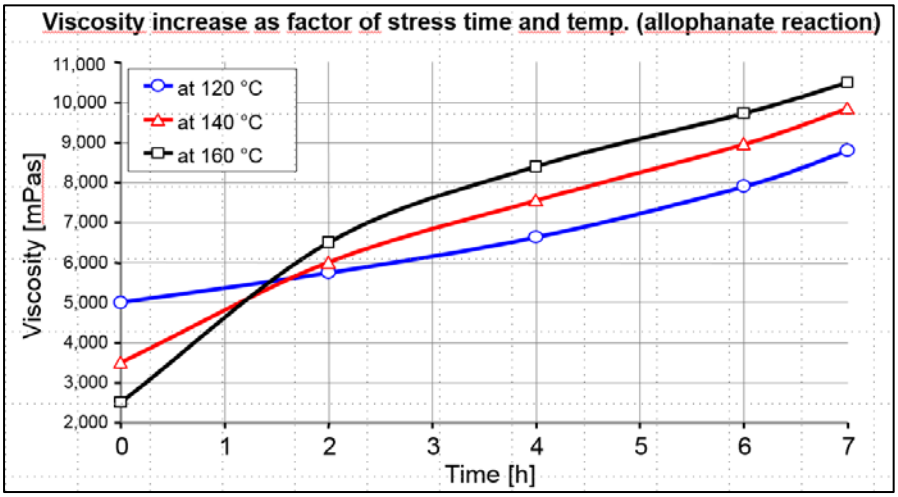
Jowatherm-Reaktant® products are supplied in moisture-proof containers of various sizes.

- Euro cartridge: Ø 47 mm, (depending on adhesive 280 g – 380 g)
- Pullring tin can: 600 g granulate
- Pullring can Ø 130 mm, with PP formliner or aluminium composite pouch (depending on adhesive 2.0 kg – 2.5 kg)
- Metal bucket: Ø 280 mm, with or without aluminium composite pouch (depending on adhesive 18 kg – 22 kg)
- Sheet metal or cardboard drum: Ø 572 mm, with or without aluminium composite pouch (depending on adhesive 160 kg – 230 kg)

1.3 Processing

Polyurethane hot melts are applied with roller systems (made of steel or with a rubber coating), nozzles or slot nozzles, spray units or handguns. All parts of the melt and applicator equipment which come in contact with the adhesive should have a non-stick coating in order to prevent catalytic reactions due to metal contact. The non-stick coating facilitates also a much easier cleaning.

In order to avoid unwanted secondary reactions, the melt and applicator units should be equipped with exact temperature controls to avoid local overheating. If the adhesive is heated beyond the recommended processing temperature, or thermal exposure over a longer period of time, the melt viscosity may increase due to a crosslinking reaction within the adhesive (allophanate reaction) - even if no moisture is present - just due to the influence of the high temperature.



Therefore, any amount of molten PUR hot melt in the operational unit should be used up within at least 4 hours. During down times (for instance breaks >30 minutes), the temperature should be sufficiently lowered (by approx. 50 °C to 80 °C below the recommended processing temperature), in order to prevent the allophanate reaction as far as possible.

The recommended processing temperature may not be exceeded. Please observe the instructions of the respective technical data sheet.

The diagram above left indicates the viscosity increase of any PUR hot melt. This is caused only by exposure to heat under exclusion of moisture. The viscosity increases much faster at higher processing temperatures.

Do not premelt more adhesive than can be used up in 4 h!

1.4 Protection with Inert Gas

If reactive hot melts are to be processed from bulk melters (tank units), the melt as well as the adhesive mass contained in the melter when cold (when unit is turned off) should be blanketed with dry inert gas to avoid any unwanted reaction of the hot melt with moisture in the tank unit. The inert gases used are for instance dry nitrogen, dry carbon dioxide, dry argon, or dry air.

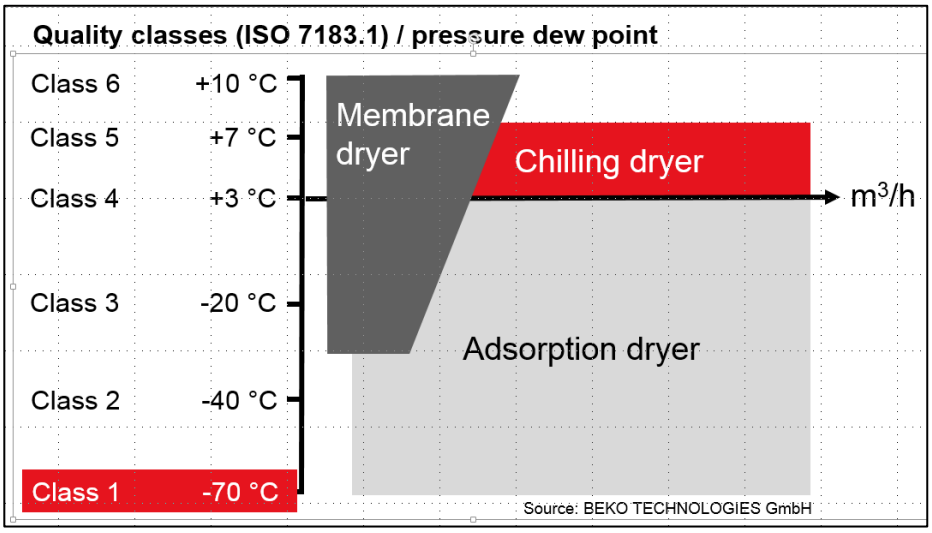
The water content of the inert gas may not exceed the value of 5 ppm (by volume, this corresponds to a value of 0.004 g/m³ under normal conditions).

This prerequisite is met by using the following inert gas qualities (common trade names in Germany):

- Nitrogen: Supply type 5.0; 5.3; 5.6; 6.0
- Carbon dioxide: Supply type 4.5; 4.8; 5.3
- Argon: Supply type 4.6; 4.8; 5.0
- Dry air: Dew point ≤ -65 °C at atmospheric pressure.

These conditions are <u>not</u> met when carbon dioxide type 2.5, and 2.7 are used, commercially available under carbonic acid, or if carbon dioxide type 3.0 is used

When adsorption dryers (for the production of dry air) are used, it has to be ensured that the feed conditions for compressed air (inlet pressure ≥8 bar absolute, temperature ≤ +36 °C) are maintained, otherwise the dry air will still contain too much water (please also observe the operating instructions of the adsorption dryer, especially after extended down times).



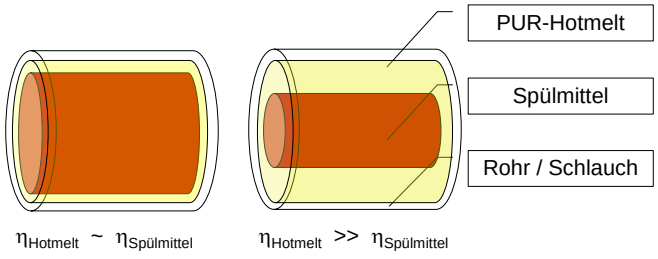
To our knowledge, the somewhat less expensive chilling and membrane dryers are not suitable for producing dry air in the required quality. The water content of the dry air produced by these units is far above the level of 5 ppm, and leads to problems in practical use.

Manufacturers of bulk melters can supply further information on the installation of suitable inert gas blanketing units

2. Instructions for cleaning and maintenance

2.1 Cartridge units

In case of longer down times, "flush out" (squeeze out the PUR hot melt, see also under 4.1) unit completely with one half cartridge of Jowat® Flushing Agent for PUR hot melt. Turn off the unit and allow cooling. When starting up again, drain the remnants of the Flushing Agent, insert a new PUR hot melt cartridge, and make sure the PUR hot melt extrudes all remnants of the Flushing Agent.



When choosing a Flushing Agent, it is important that the viscosity range of the Flushing Agent is similar to that of the PUR hot melt adhesive (see figure above).
Please observe also all recommendations of the equipment manufacturer.

2.2 Squeezeout units for bags, premelters for cylinders

In case of longer down times (holidays, periodic operation shutdowns), the system needs to be emptied, then flushed out with Jowat® Flushing Agent for PUR hot melt until all adhesive remnants are removed (see 4.2). When starting up again, drain the remnants of the Flushing Agent, fill in PUR hot melt adhesive, and make sure the PUR hot melt extrudes all remnants of the Flushing Agent.
Please observe also all recommendations of the equipment manufacturer.

2.3 Bulk melters (tank units)

Basically, the tank unit should be constantly blanketed with inert gas to avoid any reaction of the PUR hot melt adhesive with moisture. The inert gas unit has to be checked daily to see if it works properly.
If the melting units are not emptied and flushed at the end of the day and remain filled with PUR hot melt overnight, continuous blanking with inert gas is absolutely necessary to avoid any contact of the cold adhesive mass with moisture.
In case of longer down times (weekends, holidays, periodic operation shutdowns etc.), drain the unit completely, flush out with Jowat® Flushing Agent until PUR hot melt is entirely removed from the system (see 4.2). Remnants of Flushing Agent remain in the unit; the tank melter should be continuously supplied with inert gas.
When starting up again, drain the remaining Flushing Agent, fill in new PUR adhesive, and make sure the PUR hot melt extrudes all remnants of the Flushing Agent.
In case of units with bypass plates, clean bypass regularly (for instance weekly) by opening and internal circulation of the PUR through the bypass.
If a filter is installed, examine filter for clogging at least once a week (depending on throughput) by removing it and possible mechanical cleaning or with Jowat® Cleaner 930.60 (see 4.1), or replace with a new filter cartridge.
Please observe also all recommendations of the equipment manufacturer.

2.4 Drum melters

Avoid any contamination during change of drums. The heating plate is to be cleaned and remnants around the sealing ring or sealing rings are to be removed. Greasing the sealing rings with a suitable water-free and acid-free grease (*e.g. rolling bearing grease Petamo GY 193 supplied by Klueber Lubrication, Munich*) facilitates easier cleaning and shortens the down time during the change of a drum. The drum may not remain opened longer than necessary.
Please observe also all recommendations of the equipment manufacturer.

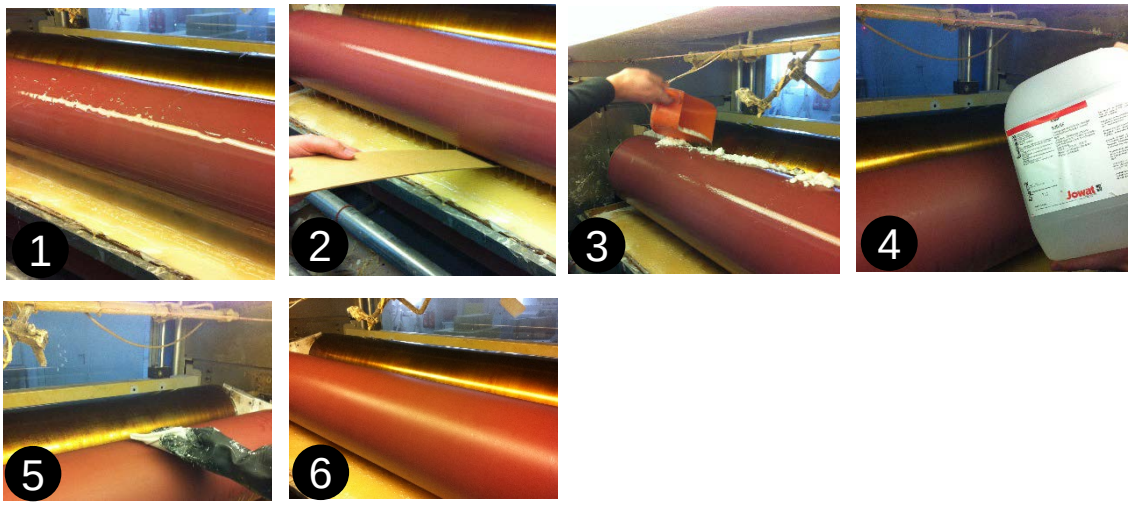
2.5 Slot nozzles and application heads

The application head, nozzle or slot nozzle may be protected over night or on weekends with a paraffin oil or mineral grease free of water and acids, or with Jowat® Flushing Agent, so that no moisture can penetrate into the system and cause an unwanted reaction.
Before start-up, clean the nozzles from the outside (during the heating phase), then extrude all Flushing Agent remnants with PUR hot melt adhesive.
Please observe also all recommendations of the equipment manufacturer.

2.6 Roller coaters (made of steel, or rollers with plastic coating (*Viton* o.s.))

Empty the roller applicator system using the cleaning programme of the machine (reverse direction). The adhesive remnants should be allowed to run into a lined basin or similar container. In addition, the liquid adhesive can be removed from the applicator roller by scrapping with a wood spatula.
Switch roller applicator to standard operation. Fill in Jowat® Cleaner 930.23/24 (approx. 1 kg) and melt. Allow to take effect with running rollers for 10 – 15 minutes then drain the unit again (if necessary, repeat this step).
Switch roller applicator unit to standard operation. Optionally, the applicator unit can additionally be cleaned with the Jowat® Cleaner 930.65 (approx. 1 kg liquid) by heating and allowing to take effect

with running rollers for 10 minutes. Then empty the applicator unit again using the cleaning programme of the machine.
Wearing appropriate gloves, remove all flushing agent remnants after cooling down – but while still warm – with a dry, lint-free cloth (if necessary, lightly soaked in Cleaner Jowat® 401.30).
Contaminated metal parts may be cleaned by boiling off (110 – 150 °C) in Jowat® 930.60. Gaskets and other rubber parts have to be removed before cleaning because they may be dissolved by the hot cleaner.
Crosslinked PUR hot melt adhesive may be removed only mechanically.
Please also observe the recommendations of the equipment manufacturer.



2.7 Rollers and open reservoirs (e.g. edgebanders and wrapping machines)

At the beginning of the shift, while the machine is warming up, remove crosslinked PUR hot melt mechanically from reservoir and roller. It is possible to clean the applicator roller with a soft brass brush and compressed air gun.
Over the weekend, holidays and other extended down times, the reservoir has to be emptied, rinsed with Jowat® Flushing Agent and again completely emptied. Residues of the Flushing Agent should be removed mechanically after cooling down. When the unit is switched on again, fill with PUR hot melt adhesive and flush out all remnants of the Flushing agent with the PUR hot melt adhesive.
For complete cleaning remove reservoir, disassemble and clean parts in a separate container with Jowat® Cleaner 930.60 at approx. 180 °C.

2.8 Cleaning of tools, nozzles, filters, and other small metal parts

Tools, nozzles, filters and other small (or disassembled) parts made of metal may be cleaned in a heated bath with Jowat® Cleaner 930.60 at approx. 180 °C (e.g. an electrical deep fat fryer is suitable). Depending on the degree of contamination, the cleaning procedure takes about 60 to 120 minutes. The temperature of the cleaning bath should not exceed 190 °C. Remove parts from the bath, allow for cooling, rinse with water and dry completely.
Please observe also all recommendations of the equipment manufacturer.

Seals and most plastic parts may be dissolved by Jowat® Cleaner 930.60 and must be replaced prior to assembly or installation.

3. Instructions for handling, safety and disposal

3.1 Change of adhesive

If PUR hot melts are to be used intermittently with other, non-PUR hot melts, it has to be checked if these products are compatible - also when switching among different PUR hot melts. Contact your adhesive supplier for further information. If the hot melts are not compatible, an unmeltable compound may form due to a chemical reaction, also due to extremely different processing temperatures. This may then require manual removal.

3.2 Protective measures in the workplace

Jowatherm-Reaktant® PUR hot melt adhesives contain Isocyanate as reactive groups. While at ambient temperature, all components of the hot melt are almost non-volatile, isocyanate vapours may form during melting and processing of the hot melt. The German MAK-value (= max. concentration in the workplace/TLV) for monomer isocyanate (MDI) is 0.005 ppm (0.05 mg/m³).
In any case, PUR hot melt vapours which may form have to be extracted via suitable exhaust systems just like those for any other hot melt. With appropriate exhaust systems, the values will remain far below the a.m. TLV limits, and safe working conditions are ensured.
Please, observe the instructions of the corresponding material safety data sheet.

Please observe: Allergies do not respect limit values!!

3.3 Environmental protection

The extracted air containing isocyanate is subject to the local laws concerning clean air. In Germany, the regulations of the "TA Luft" (technical regulations concerning clean air limit values) classifies isocyanates in class 1. For products in class 1, the upper concentration limit of 20 mg/m³ may not be exceeded, when the emission exceeds 100 g/h.
The emissions may have to be monitored by suitable equipment.
Monomer Isocyanate (MDI) is considered to be hazardous to water (WGK: 1).

3.4 Disposal and recycling

When processing Jowatherm-Reaktant® PUR hot melt adhesives, any residual amounts of adhesive or mixtures of adhesive with cleaner or flushing agents should be disposed of in a professional and correct way, in order to avoid any detrimental effect on humans and the environment.

3.4.1 Disposal of PUR hot melt adhesive residues

Fully crosslinked PUR hot melt can be disposed of as “adhesive waste“ under the European Waste Catalogue Number *080410*; disposal is possible on household waste disposal sites or household waste incineration plants. To achieve complete crosslinking, allow sufficient exposure time of the adhesive with moisture.

3.4.2 Disposal of flushing agent

The flushing agent is also classified in Germany as “adhesive waste“ and at ambient temperature solid. It is also covered by the European Waste Catalogue Number *080410.* Disposal is possible on household waste disposal sites or incineration plants for household waste.

3.4.3 Disposal of used cleaning agent

Normally, liquid cleaners like Jowat® Cleaner 930.60 must undergo disposal as special waste in Germany, since household waste deposit sites do not accept liquids. The classification is EWC No. *070208*, "other reactive and distillation residues (incineration plants).

For further information concerning handling, transport and disposal, please refer to the respective Safety Data Sheet.

3.6 Recycling of packaging material

Recycling of packaging material is to be carried out according to local/national regulations.

Example:
INTERSEROH Dienstleistungs GmbH
Stollwerckstraße 9a
51149 Köln
Phone: +49 (0) 2203 9147-0
Fax: +49 (0) 2203 9147-1394
E-Mail: info@interseroh.com

- Tin can / aluminium can — Interseroh take-back system
- 20 l metal hobbock (with/without foil bag) — Interseroh take-back system
- Foil bag — Interseroh take-back system
- 200 l metal drum (with/without foil bag) — Interseroh take-back system

4. Jowat® Flushing Agents and Jowat® Cleaner for PUR hot melt adhesives

4.1 Cleaning agents | Products

Jowat®		402.38	402.40	401.30
Type		Cleaner	Biological cleaner	Cleaner
Viscosity at 20 °C	[mPas]	fluid	fluid	fluid
Density	[g/cm³]	approx. 0.8	approx. 0.85	approx. 0.9
Appearance / colour		colourless	colourless	colourless
Application		Cold cleaner For cleaning fully reacted adhesive residues from metal components	Cold cleaner For cleaning of adhesive-residues ----- Natural raw mat.	Cold cleaner Only for cleaning liquid PUR prepolymer (ethyl acetate)

4.2 Flushing agents | Products

Jowat®		930.23/24	930.20	930.65	930.34	930.74	930.94
Type		Cleaner	Cleaner	Flushing agent	Flushing agent	Flushing agent	Flushing agent
Viscosity at 20 °C	[mPas]	solid powder	solid powder	pasty	solid	solid	solid
Viscosity at 120 °C	[mPas]	fluid	fluid	fluid	approx. 8,500	approx. 25,000	approx. 120,000
Density	[g/cm³]		approx. 1.05	approx. 1.05	approx. 0.95	approx. 0.95	approx. 0.95
Softening ranges	[°C]	approx. 50	approx. 65	-	approx. 80	approx. 80	approx. 80
Appearance / colour		white	white	beige	red	red	red
Application		For flushing and cleaning of roller applicators (roller coater) ----- Very good cleaning efficiency.	For flushing and cleaning of roller applicators (roller coater) ----- good cleaning efficiency.	For flushing and cleaning of roller applicators (roller coater)	Low viscosity For flushing of applicators, hoses and nozzles ----- Reaction inhibitor!	Med. viscosity For flushing of applicators, hoses and nozzles ----- Reaction inhibitor!	High viscosity For flushing of applicators, hoses and nozzles ----- Reaction inhibitor!

4.3 Chemical cleaning of metal components | Products

Jowat®		930.60
Type		Cleaner
Viscosity at 20 °C	[mPas]	fluid
Viscosity at 120 °C	[mPas]	-
Density	[g/cm³]	approx. 1.10
Softening range	[°C]	-
Appearance / colour		colourless
Applications		For cleaning of very heavily soiled metal parts (nozzles, rollers, filters etc.) ----- Dissolved cracking and crosslinked adhesive

For additional information, please refer to the respective Technical Data Sheet (please request)