DOE/CE/23810--8E

DE93 007826

# COMPATIBILITY OF REFRIGERANTS AND LUBRICANTS WITH ENGINEERING PLASTICS

## Quarterly Technology Progress Reports

1 July 1992 - 30 September 1992
1 October 1992 - 31 December 1992

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January 1993

**Prepared for**
**The Air-Conditioning and Refrigeration Technology Institute**
**Under**
**ARTI MCLR Project Number 650-50800**

This project is supported, in whole or in part, by U.S. Department of Energy grant number DE-FG02-91CE23810: Materials Compatibility and Lubricants Research (MCLR) on CFC-Refrigerant Substitutes. Federal funding supporting this project constitutes 93.67% of allowable costs. Funding from non-government sources supporting this project consists of direct cost sharing of 6.33% of allowable costs; and in-kind contributions from the air-conditioning and refrigeration industry.

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## ABSTRACT

Seven oil immersion studies were completed at both 20°C and 60°C. Test bars used in this study fall within the manufacturer specification limits of physical consistency and integrity. Refrigerant Immersion studies at ambient and 60°C are also complete. Equilibrium refrigerant gas solubilities of the 32 ISO VG branched acid polyolester with all ten refrigerants have been determined and completed at 20°C. Finally, the thermal aging of plastics at constant refrigerant pressure exposure with seventeen refrigerant lubricant combinations have been completed.

## SCOPE

The scope of this research provides compatibility information regarding plastics exposed to a wide variety of lubricant and refrigerant combinations. Data on the dimensional changes of plastic polymers were measured and the immersion and tensile properties were determined. Physical changes will be measured after ambient aging, under stress and after thermal aging for various lubricant and refrigerant combinations at constant pressure.

## SIGNIFICANT RESULTS

### PHYSICAL AND CHEMICAL PROPERTIES OF ENGINEERING PLASTICS AND LUBRICANTS

Physical and chemical changes in plastics exposed to differing chemical environments are generally specific to polymer type, processing and synthesis. Individual manufacturers, generally, have their own patent or proprietary methods for polymer synthesis and are not directly identified by generic name alone. As a result, molded polymers from different companies will often perform differently. Molecular weight, molecular weight distributions, polymer structure, chain length, density and processing may account for some of the observed differences. Data contained in this report reflect changes in properties of generic plastics obtained from specific manufactures.

Table A-1 identifies trademarks, registered trademarks or copyrighted names of plastics used in this study. In addition table A-1 identifies each plastic by an assigned number, referred to throughout the Appendixes.

The lubricants identified in Appendix A-1 are listed by manufacturer and generic name. This study only reflects the physical changes caused by the specific lubricant used and does not constitute a universal answer that all lubricants in the general category will have the identical behavior.

Table A-2 identifies the processing conditions used to mold the plastic test bars according to manufactures' specifications. Plastics are categorized by plastic number, name brand, manufacturer and generic type. Manufacturer specifications are used as starting guide lines for molders. Therefore, cylinders and molded temperatures may differ slightly to obtain the best mold test bars.

### PLASTIC MOLD

A production quality steel thermoplastic/thermoset injection mold design was approved in February, 1992. The mold was completed on March 15, 1992. The first test material, a nylon 6/6 material, was tested and performed as expected. Each cavity has been numbered. Originally each cavity had two ejector pins located at opposite ends of the mold. Two additional ejector pins were included in later versions to improve straightness. Without these additional ejector pins, bending occurred in the gage area of the test bars. The quality of the

mold finish in the gage area was improved to a 6F stone. Original test bars had smooth extension tabs. To minimize possible slippage during testing 0.005" molded nipples are now included on each side of the tab.

Also included in this study are effects on thermoset phenolic materials exposed to differing lubricant/refrigerant combinations. Unlike thermoplastic materials, injection thermoset materials require a longer mold residence time under increased pressure and temperature. Injection ports, sprues and gates are made larger than normal to improve plastic homogeneity and reduce and physical degradation of the plastics.

The thermoplastic mold was designed to handle both types of plastics materials. Provisions were made for a large cartridge heater necessary for a phenolic thermoset curing reaction. The phenolic used in this study was almost completely cured in the mold prior to ejection. The final test parts will be post cured for the recommended time, as required for completion of the reaction.

## ENGINEERING PLASTICS

With the exceptions of DuPont PTFE and DuPont Vespel DF and DF-ISO, which were used as received, the test plastics were molded into the modified type 5 ASTM test bars. These DuPont plastics required special molding operations and sintering equipment not available to this laboratory. The DuPont Teflon PTFE test bars were rule die cut from sheet grade virgin PTFE. The supplied test bars were cut as specified in ASTM D 1457-91a, "Standard Specification for Polytetrafluoroethylene (PTFE) Molding and Extrusion Materials" and as defined in Figure 13, Microtensile Test Bars.

DuPont Vespel DF products are produced from granulated polyimide powder and formed to near net shapes by a very high pressure compaction process. DuPont Vespel DF-ISO products are also compaction molded but are also densified by sintering under pressure in liquid metal. Vespel test bars were compression molded, by DuPont, as per the ASTM E8-91 "Standard Test Methods of Tension Testing of Metallic Materials" and produced to shape as defined in Figure 16.

Due to its high creep cold flow properties, the Teflon PTFE plastic will not be tested in the creep rigs. All plastics have been molded as close to manufactures specifications as possible, see Table A-2. Consistency among test specimens was determined by tensile measurements of five individual unaged test bars. All unaged test bars met the manufacturers reported tensile properties of the molded engineering plastic. The unaged data is presented as an average of five test bars in Appendix F. The creep loads are 25% of ultimate tensile.

## LUBRICANT PREPARATION

The lubricants used in this testing program were degassed and dried by heating quantities of the bulk fluid to 60°C (140°F) under vacuum for at least 24 hrs. Moisture content did not exceed 50 ppm, while the total acid number of the fluids were below 0.05 mg. KOH/gm.

## LUBRICANT IMMERSION STUDIES

Evaluation of the plastic test specimens at the required temperatures (60°C and 100°C) have been completed, and is presented in Appendix B. All plastics were immersed in the test lubricant in screw cap sealed vials under nitrogen cover at the specified aging temperature for 14 days. The dimensional property changes observed indicated that all of the plastics were affected by the lubricants in some way. Tables for each lubricant at the two temperatures are provided in Appendix B, which summarizes the average percent affect on measured parameters.

Dimensional property changes did not reflect changes in tensile properties. However, changes in dimension does suggest that some lubricant absorption has taken place, possibly impacting physical properties of the plastic.

## REFRIGERANT QUALITY

Refrigerants received for use in this study were checked by packed column gas chromatography for contaminant content by other refrigerant gases. The refrigerants were found to have little, if any, contamination. Moisture content in the refrigerants was not determined.

## REFRIGERANT IMMERSION STUDIES

The liquid refrigerant immersion studies were performed in separate stainless steel pressure tubes equipped with a gas space and a metering needle valve. The tubes were filled using a special low volume, low loss, stainless steel manifold. Prior to filling, the tubes were evacuated to 20-30 millitorr for several minutes and then chilled in ice water before filling. The valves were closed and then sequentially opened for filling with liquid refrigerant. Typically the plastic specimens were exposed to about 20 grams of liquid refrigerant.

At the end of the exposure time, the refrigerants were exhausted from the stainless steel tube as liquid into $LN_2$ cooled tared test tubes. The residues, if any, were then concentrated by boiling off the refrigerant. The amount of extractables generally ranged between 5 to 15 mg.

All refrigerants were found to affect the plastic parts in some way. A weight gain and some softening in the plastic was usually observed. With clear plastics the polymer takes on a silvery appearance. Generally the HFC refrigerants appear to least affect the plastics. The three plastics that seem to be most severely affected are ABS, polyphenylene ether, and polycarbonate. Although these results suggest the three plastics should not be tested in the 32 ISO VG branched acid polyolester with 40% refrigerant concentrations the presence of polyolester oil may allow the materials to survive the creep testing.

Aging for 14 days at ambient and 60°C (140°F) in pure refrigerant was performed at the refrigerant saturation pressure. The thermal aging of the plastics with selected refrigerant lubricant combinations was performed at 150°C (300°F). The pressure of the refrigerant was controlled to fall within 275-300 psia (19-20bar).

## TENSILE AND PERCENT ELONGATION MEASUREMENTS

The tensile tests were conducted using an Instron Model 1122 with a modified ASTM type 5 tensile bar. The plastics were placed vertically in test grips attached to the crosshead via a self-aligning universal yoke. The crosshead movement was set at the specified ASTM D678 pull rates and were between 0.2 and 1.2 mm/min. The load cell resolution is 0.5% of the observed force and has a load range of 0 to 120 Kg.

The physical property values of aged test bars reported in Appendix F are derived from two samples of test bars exposed to the selected refrigerant/lubricant environment, where as the unaged properties are from five test pieces. Percent elongation and ultimite tensile were calculated from the physical test data provided by the Instron measurements. Percent elongation is the total change in length divided by the one inch (25.4 mm) necked down length. The change in length is measured by the amount the crosshead moves from the original position until the instant the plastic bar breaks. Ultimate tensile is the maximum recorded load divided

by the cross-sectional area of the gage region of the plastic test piece. Plastics thermally aged in different oil and refrigerant environments are then compared to the values of nontreated plastics. Relative percent changes are calculated and examined for significant changes.

## STRESS CRACK-CREEP RUPTURE TEST CELLS

Currently all test cells are complete. Creep stress is currently being performed at 25% of the ultimate tensile load. Previous experiments at lighter loads, indicated that nylon test bars were insufficiently stressed. At lighter loads the nylon samples were in a purely elastic region resulting in spring-like behavior. Experiments with 25% load gave the best creep curve function and provided sufficient load to stress the gage area of the test bar within the 14 day test period.

### Creep Measurement Process

The principal of creep rupture measurement required the use of sensitive, long term noise free electronics. Initially a commercial LVDT computer board system was used to measure creep. However unacceptable oscillatory noise was observed in test specimens using the 25% of dead weight loads. The origin of this unwanted noise seemed to originate with the sampling board.

It was determined that powering each LVDT with individual amplifiers and frequency source eliminated the noise. Unfortunately the required amplifiers were not immediately available. Thus, all boards presently in use for this study were designed, built and tested by IRI.

The use of individual amplifiers has allowed us to sample each cell at an hourly rate using four separate 15 second sample times averaged as a single test point. This increase in averaging further improves accuracy by eliminating random noise. Using individual amplifiers allows for rapid change out in the event of channel failure. Currently the sensitivity of the measurement is $1.5 \times 10^{-4}$ inches; an improvement from the $2.5 \times 10^{-4}$ inches stated in the last report. It is believed that this measurement level represents the best compromise between movement, position and reduced measurement noise.

We are not planning, at this time, any changes in the sensitivity of the creep rupture experiment. However, depending on the progression of the experiment we may wish to increase the sensitivity. Any change would be on the order of $75 \times 10^{-6}$ inches which would improve measurements in plastics showing minimal creep.

### Creep Modulus

The plastics used in refrigeration and compressor systems are expected to have high reliability and long-term stable qualities. The compressor and system design engineer requires information regarding physical property changes for proper engineering usage. The property of plastics under long-term load and at varying conditions provide measurable changes that are essential for an understanding of material behavior. Such material behavior is described in terms of creep properties.

The phenomenon of deformation under load is referred to as creep. In this study creep was measured for plastics submerged in a 32 cSt synthetic lubricant, 32 ISO VG branched acid polyolester, with selected refrigerants maintained at 40% concentration by weight at $20^{o}C$ ($68^{o}F$).

The plastic test bars were held in screw clamped stainless steel jaws. The clamping procedure consisted of first centering the test piece between the jaws and firmly squeezing the plastic tabs. An hour after the initial tightening the jaws are retightened to take up any cold flow which may have occurred in the jaw area.

Prior to loading, the test bars are immersed in the lubricant in a 100 millitorr vacuum for several hours removing any air. Liquid refrigerant is added to the bottom of the test cylinder through a needle valve. The cylinders are charged to a previously calculated gas pressure known to yield 40% refrigerant by weight.

The sample is loaded by slowly releasing a predetermined dead weight providing 25% of the samples ultimate tensile strength. When the plastic part is loaded, it rapidly deforms to a strain roughly predicted by its previously determined stress-strain modulus. With time and/or temperature the plastic part continues to deform until rupture or yielding causes failure.

Figure 1, illustrates a typical creep curve of the test plastics and shows four distinct regions on the creep curve. The first stage shows the near instantaneous elastic deformation of the gage area. The second stage, called primary creep, is more easily seen and is the strain which occurs much more rapidly but at a decreasing rate. The third stage, sometimes called cold flow, is the linear region of the curve and is characterized by a constant rate of creep. In most of our plastics so far we have not seen the fourth stage which is failure or rupture. The exceptions are the acrylonitrile-butadiene-styrene terpolymer and the modified polyphenylene oxide which fail within one hour in lubricant and refrigerant, (Table D-1,-2,-3).

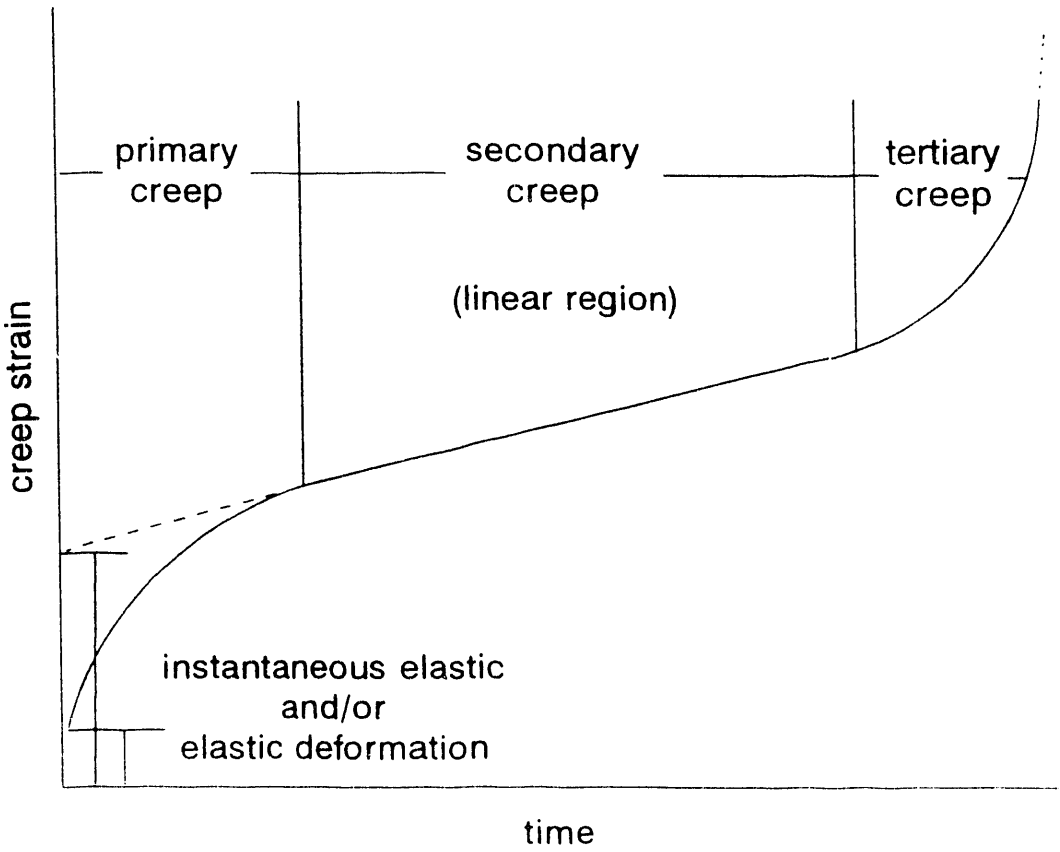


Figure 1. Typical Creep Curve

Appendix D is devoted to the analysis of the first three sections on the creep curve as described above. The charts in Appendix D list the creep modulus, (ksi,Kg/M$^2$), at five

different times in hours (10, 50, 100 200 and 300) along with a remarks column. The remarks column describes the fourth section of the curve where the actual failure occurs.

Creep measurements are generally a long term experimental process that can take months or years of examination. During this time period a much larger dimensional change takes place and all three phases of the creep curve can be properly defined. We are currently trying to identify a creep value and the environmental affects of synthetic lubricant and differing refrigerants on plastic parts under stress, within a 14 day time frame. The sensitivity of the measurement, the smallest amount of movement measurable, becomes paramount as it is related to long term environmental chemical exposure. It is not entirely unlikely that what is currently being identified as the second and third regions on the creep curve may be primary, and not long term creep.

Most manufacturers publish plastic creep values as several different temperatures and loads. In this study, we initially considered creep testing at 60°C (140°F) with refrigerant at a specific pressure, thus allowing the refrigerant concentration to be whatever it is at a specified pressure. However in order to have the plastic exposed to a greater amount of refrigerant a temperature reduction was necessary. Due to equilibrium gas solubility limitations of some of the HFC's it was decided to limit the concentration to 40% by weight since this was achievable with the 32 cSt branched acid, polyolester at 20°C (68°F) and not at 60°C (140°F) .

Using a temperature of 60°C (140°F) with the 32 cSt branched acid polyolester, would require the pressure of the creep rigs to be limited to 300 psia for safety reasons similar to the thermal aging portion of this study. Vapor equilibrium concentration determinations are needed to determine the exact concentration of refrigerant in lubricant at this elevated temperature.

## THERMAL AGING OF PLASTICS WITH REFRIGERANT AND LUBRICANT

The thermal aging of plastic test bars at 150°C (300°F) for 14 days with selected refrigerants and lubricant combinations, was conducted in stainless steel pressure tubes (as described previously) with refrigerant pressure not to exceed 275-300 psia. Following 14 days of thermal and pressure aging, the plastic test bars were pulled for tensile strength retention. The seventeen combinations required are now complete. Detailed results of each refrigerant and lubricant combination are included in the tables of physical change data appearing in Appendix's E and F.

At the onset of the thermal aging experiment, it was decided to eliminate ABS, Polycarbonate and modified Polyphenyleneoxide since very poor results in the refrigerant exposure examinations were observed. These plastics are, however, still being used in the creep-rupture experimentation.

It was decided to age plastic test bars in HCFC-123 (R-123) at 125°C (257°F) instead of the specified 150°C (300°F) since there is a known degree of reactivity or instability of this refrigerant and lubricant combination at the higher temperature. Unfortunately this temperature may still have been to high since most of the plastics specimens failed. After some discussion with the MCLR advisory committee it was decided to rerun the experiments with aging temperatures of 105°C (221°F). This data, along with the higher temperature, is included in appendix E and F.

### Discussion of Results

The second portion of this study entails evaluating the end result of property changes in plastics at elevated pressure and temperature conditions. Using a test temperature of 150°C

(300°F) for all plastics except the polypropylene homopolymer [exposed at 100°C (212°F)] precludes the assumption that all plastics are stable at these temperatures. Two lower temperatures of 105°C (221°F) and 125°C (257°F) were used with HCFC-123 (R-123) due to the refrigerant being more reactive than the other HFC and HCFC's.

Plastic test bars are tested at conditions similar to production situations. Simulating production conditions, plastics were allowed to equilibrate at ambient moisture level conditions. Generally, plastics pick up moisture of hydration or adsorption. The moisture level can vary dramatically. Lubricants used in this study were dried to less than 50 ppm water. The ratio of plastic to lubricant weight was approximately 50:50 in all of the cases, which is not typical in product refrigeration systems. However, the use of larger quantities of lubricant would require larger quantities of limited refrigerants. Polyolesters can be hydrolyized by water. The rate of hydrolysis is dependant on water concentration, time and temperature as well as the types of catalysis present. Therefore, we must remain cautious when interrupting elevated temperature immersion data with potentially "wet" plastics.

With the exception of the hydrocarbon lubricants of mineral oil and alkylbenzene, the polyalkylene glycols (PAG) and polyolesters are less stable and can be reactive to released water from the plastic. During the 14 day test, some polyols seem to have produced carboxylic acids and an assortment of other compounds; some more aggressive than the lubricant.

The current study involved plastics in the presence of refrigerants and lubricants at elevated temperatures and pressures. However, some mechanism of identifying the affects contributed by the refrigerant alone would be beneficial.

The Acetal (3), Polybutylene terephthalate [PBT] (18) and Polyethylene terephthalate [PET] (10) left a floculant precipitate when the oil was at room temperature for several days. This material is an extractable component, possibly an oligemer of some kind, that can be a circulating contaminant. In small hermetic appliance systems a PBT and PET extractable is not removed from the lubricant by descant beads or the more polar aluminas due to its size. Instead, the materials can separate from the oil in a cool place like in a bullet drier exit port and provide a means for plugging capillary tubes. In larger quantities of lubricant, the extractable amount probably will remain in solution but separable when high amounts of HFC's are present. The PET plastic and extractable are dependent on manufacture and the retrograding process that occurs with temperature. The extractable of PET's are increased with time and temperature. Depending on the polyolester lubricant used this process may be accelerated.

The acetal (3) plastic evaluated in this study belongs to a family of materials that have acquired food-grade use status. The samples of lubricant used for the acetal (3) exposure were reexamined because of the drastic loss in tensile retention of the plastic part. The retained lubricant sample had a very strong odor of formaldehyde. The acetal (3) product literature indicated that when acetal (3) is heated to 120°C for any length of time, formaldehyde is released. The presence of formaldehyde was confirmed by trapping formaldehyde with benzyl ethanol amine and detecting its presence as the 3-benzyl oxazolidine derivative by gas chromatography. The fromaldehyde was removed from the lubricant by purging a portion of the lubricant sample with nitrogen and trapping the effluent gas on chromasorb coated with benzyl ethanol amine, followed by extraction with methylene chloride and confirmed by gas chromatography.

Appendix E, which details physical dimensional changes, indicate that most plastics show only minimal changes in size. However in Appendix F, which details the tensile properties of the test plastics, it is clear that all of the plastics are affected to some degree. The exact reason for tensile retention loss in test plastics after thermal aging, without knowing the individual affects caused by temperature, lubricant and refrigerant, is not known.

## COMPLIANCE WITH AGREEMENT

Imagination Resources has complied with all requirements of the agreement.

## PRINCIPAL INVESTIGATOR EFFORT

Richard Cavestri (Principle Investigator) has devoted 1240 hours on this program. Technicians and other investigators have worked approximately 2340 hours on this project since the beginning of the research project.

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## THE ENGINEERING PLASTICS USED IN THIS TESTING PROGRAM ARE REGISTERED TRADEMARKS, TRADEMARKS, OR ARE NONE OF THE RESPECTIVE MANUFACTURER

| ENGINEERING PLASTIC | | | | REGISTERED TRADEMARK, TRADEMARK, OR NONE |
|---|---|---|---|---|
| NO. | TRADENAME | GENERIC NAME | MANUFACTURER | |
| 1 | AMODEL AD-1000 HS | POLYPHTHALAMIDE | AMOCO | REGISTERED TRADEMARK |
| 2 | CYCOLAC GPM 4700 | ACRYLONITRILE-BUTADIENE-STYRENE TERPOLYMER | G.E. | REGISTERED TRADEMARK |
| 3 | DELRIN II 11500 | ACETAL | DUPONT | REGISTERED TRADEMARK |
| 4 | DUREZ | PHENOLIC | HOOKER | REGISTERED TRADEMARK |
| 5 | KYNAR 720 | POLYVINYLIDENE FLUORIDE | ATOCHEM | REGISTERED TRADEMARK |
| 6 | LEXAN 161 | POLYCARBONATE | G.E. | REGISTERED TRADEMARK |
| 7 | NORYL 731 | MODIFIED POLYPHENYLENE OXIDE | G.E. | REGISTERED TRADEMARK |
| 8 | PROFAX 6331 NW | POLYPROPYLENE | HIMONT | TRADEMARK |
| 9 | RADEL A-200 | POLYARYLSULFONE | AMOCO | REGISTERED TRADEMARK |
| 10 | RYNITE 530 | POLYETHYLENE TEREPHTHALATE | DUPONT | REGISTERED TRADEMARK |
| 11 | SUPEC G401 | POLYPHENYLENESULFIDE | G.E. | REGISTERED TRADEMARK |
| 12 | TEFLON | POLYTETRAFLUOROETHYLENE | DUPONT | REGISTERED TRADEMARK |
| 13 | TORLON 4203L | POLYAMIDE-IMIDE | AMOCO | REGISTERED TRADEMARK |
| 14 | TORLON 4301 | POLYAMIDE-IMIDE | AMOCO | REGISTERED TRADEMARK |
| 15 | ULTEM 1000 | POLYETHERIMIDE | G.E. | REGISTERED TRADEMARK |
| 16 | ULTEM CRS 5001 | MODIFIED POLYETHERIMIDE | G.E. | REGISTERED TRADEMARK |
| 17 | ULTRAPEK (PAEK) | POLYARYLETHERKETONE | BASF | REGISTERED TRADEMARK |
| 18 | VALOX 325 PBT | POLYBUTYLENE TEREPHTHALATE | G.E. | REGISTERED TRADEMARK |
| 19 | VESPEL-DF | POLYIMIDE-DF | DUPONT | REGISTERED TRADEMARK |
| 20 | VESPEL DF-ISO | POLYIMIDE-DF-ISO | DUPONT | REGISTERED TRADEMARK |
| 21 | VICTREX PEEK 450G | POLY(ARYLETHERETHERKETONE) | ICI | TRADEMARK |
| 22 | XYDAR MG 450 | LIQUID CRYSTAL POLYMER | AMOCO | REGISTERED TRADEMARK |
| 23 | ZYTEL 101 | 66 NYLON, POLYAMIDE | DUPONT | REGISTERED TRADEMARK |

## THE SYNTHETIC LUBRICANTS USED IN THIS TESTING PROGRAM ARE REGISTERED TRADEMARKS, TRADEMARKS, OR ARE NONE OF THE RESPECTIVE MANUFACTURER

| NAME | TYPE | MANUFACTURER | REGISTERED TRADEMARK, TRADEMARK, OR NONE |
|---|---|---|---|
| ALLIED SIGNAL AL 150 | MODIFIED POLYGLYCOL | ALLIED-SIG. | NONE |
| B-VRO-15 | MINERAL OIL | BV ASSOC. | NONE |
| EMERY 2927-A | BRANCHED ACID POLYOLESTER | HENKEL | REGISTERED TRADEMARK |
| EMKARATE RL244 | MIXED-ACID POLYOLESTER | ICI | TRADEMARK |
| EMKAROX VG32 | PP GLYCOL BUTYL MONO ETHER | ICI | REGISTERED TRADEMARK |
| POLYGLYCOL P-425 | POLYPROPYLENE GLYCOL DIOL | DOW CHEMICAL | NONE |
| SHRIEVE ZEROL 150 | ALKYLBENZENE | SHRIEVE CHEM. | REGISTERED TRADEMARK |

# ENGINEERING PLASTICS MOLDING SPECIFICATIONS AND MOLDING CONDITIONS

TABLE A–2

| Plastic Type/Manufacturer | No | MANUFACTURE'S SPECIFICATIONS: Drying time (hour) | Drying temp (deg. F) | Drying temp (deg.C) | Cylinder temp (deg. F) Range | Cylinder temp (deg.C) Range | Injection Pressure (psi) | Injection Pressure (KPa) | Mold temp (deg. F) | Mold temp (deg.C) | ACTUAL MOLDING CONDITIONS: Drying time (hour) | Drying temp (deg. F) | Drying temp (deg.C) | Cylinder temp (deg. F) Front b | Cylinder temp (deg.C) Front b | Cylinder temp (deg. F) Mid b | Cylinder temp (deg.C) Mid b | Cylinder temp (deg. F) Rear b | Cylinder temp (deg.C) Rear b | Cycle time (sec) | Injection Pressure (psi) | Injection Pressure (KPa) | Mold temp (deg. F) | Mold temp (deg.C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Amodel AD - 1000HS Polyphthalamide/Amoco | 1 | a | 175 | 79 | 585–625 | 307–329 | a | a | a | a | 14.5 | 300 | 149 | 615 | 324 | 600 | 316 | 595 | 313 | 18 | 750 | 5173 | 180 | 82 |
| Cycolac GPM4700 ABS/GE | 2 | 2–4 | 190–200 | 88–93 | 400–475 | 204 246 | 6000–20000 | 55178–137944 | 120–140 | 49–60 | 11 | 190 | 88 | 460 | 238 | 455 | 235 | 450 | 232 | 15 | 800 | 5518 | 120 | 49 |
| Delrin II - 11500 Acetal/DuPont | 3 | a | a | a | 400–440 | 204–227 | 10000–16000 | 68972–110356 | 180–220 | 82–104 | 666 | 190 | 88 | 430 | 221 | 425 | 218 | 420 | 216 | 15 | 700 | 4828 | 180 | 82 |
| Durez 153 Phenolic/Hooker | 4 | a | a | a | a | a | a | a | 340 | 171 | NOT REQUIRED | NOT REQUIRED | NOT REQUIRED | 170 | 77 | 170 | 77 | 170 | 77 | 60 | 545 | 3759 | 355 | 179 |
| Kynar 720 Polyvinylidene Chloride ATOChem | 5 | NOT REQUIRED | NOT REQUIRED | NOT REQUIRED | 375–450 | 191–232 | MAX | MAX | 120–200 | 49–93 | NOT REQUIRED | NOT REQUIRED | NOT REQUIRED | 445 | 229 | 435 | 224 | 435 | 224 | 15 | 700 | 4828 | 150 | 66 |
| Lexan 161 Polycarbonate/GE | 6 | 3–4 | 250 | 121 | 520–570 | 271 299 | 12000–20000 | 82767–137944 | a | a | 15 | 300 | 149 | 555 | 291 | 545 | 285 | 535 | 279 | 18 | 1200 | 8277 | 110 | 43 |
| Noryl 731 Polyphenylene ether/GE | 7 | 2–4 | 230–250 | 110–121 | 540–570 | 282–299 | 10000–18000 | 68972–124150 | 180–210 | 71–99 | 11 | 190 | 88 | 560 | 293 | 555 | 291 | 550 | 288 | 15 | 850 | 5860 | 150 | 66 |
| Plenco 04465 Phenolic/Chem Eng | 8 | a | a | a | a | a | 2000–6000 | 13794–41383 | 300–360 | 149–182 | NOT REQUIRED | NOT REQUIRED | NOT REQUIRED | 170 | 77 | 170 | 77 | 170 | 77 | 60 | 545 | 3759 | 355 | 179 |
| Profax 6331NW Polypropylene/Himont | 9 | a | a | a | a | a | a | a | a | a | NOT REQUIRED | NOT REQUIRED | NOT REQUIRED | 415 | 213 | 400 | 204 | 395 | 202 | 15 | 700 | 4828 | 105 | 41 |
| Radel A–200 Polyaryl Sulfide/Amoco | 10 | 2.5 | 350 | 177 | 650–725 | 343–385 | a | a | 260–325 | 138–163 | 15 | 300 | 149 | 745 | 396 | 735 | 391 | 730 | 388 | 21 | 900 | 6207 | 305 | 152 |
| Rynite 530 Polyethylene Terephthalate DuPont | 11 | 2–3 | 250–275 | 121–135 | 555 | 291 | a | a | 190–250 | 88–121 | 14.5 | 300 | 149 | 550 | 288 | 545 | 285 | 540 | 282 | 20 | 750 | 5173 | 180 | 82 |
| Supec G401 Polyphenylene Sulfide/GE | 12 | 3–4 | 285 | 141 | 580–630 | 304–332 | a | a | 280–320 | 138–160 | 14.5 | 300 | 149 | 615 | 324 | 600 | 316 | 595 | 313 | 18 | 750 | 5173 | 180 | 82 |
| Torlon 4203L Polyamide–imide/Amoco | 13 | 6–24 | 250–350 | 121–177 | 580–650 | 304–343 | MAX | MAX | 390–420 | 199–216 | 48 | 350 | 177 | 675 | 357 | 660 | 349 | 650 | 343 | 20 | 1700 | 11725 | 425 | 218 |
| Torlon 4301 Polyamide–imide/Amoco | 14 | 6–24 | 250–350 | 121–177 | 580–650 | 304–343 | MAX | MAX | 390–420 | 199–216 | 48 | 350 | 177 | 675 | 357 | 660 | 349 | 650 | 343 | 20 | 1700 | 11725 | 450 | 232 |
| Ultem 1000 Polyetherimide/GE | 15 | 4 | 300 | 149 | 660–800 | 349–427 | 10000–20000 | 68972–137944 | 130–250 | 54–121 | 15 | 300 | 149 | 775 | 427 | 770 | 410 | 765 | 407 | 21 | 1000 | 6897 | 255 | 124 |
| Ultem CRS 5001 Polyetherimide/GE | 16 | 4 | 300 | 149 | 660–800 | 349–427 | 10000–20000 | 68972–137944 | 150–350 | 66–177 | 15 | 300 | 149 | 775 | 413 | 770 | 410 | 765 | 407 | 21 | 1000 | 6897 | 255 | 124 |
| Ultrapek Polyetherketone/BASF | 17 | a | a | a | 716–788 | 380–420 | a | a | a | a | 14 | 250 | 121 | 765 | 407 | 755 | 402 | 745 | 396 | 19 | 800 | 5518 | 375 | 191 |
| Valox 325 PBT Polyethylene Terephthalate General Electric | 18 | 3–4 | 250 | 121 | 455–480 | 235–249 | 6000–10000 | 55178–68972 | 60–150 | 16–66 | 11 | 190 | 88 | 480 | 249 | 475 | 246 | 470 | 243 | 15 | 900 | 6207 | 110 | 43 |
| Victrex PEEK 450G Polyetheretherketone/ICI | 19 | 3 | 300 | 149 | 698 | 370–420 | 10000 20300 | 68972–140013 | 356–374 | 180–190 | 15 | 300 | 149 | 725 | 385 | 715 | 379 | 710 | 377 | 25 | 1100 | 7587 | 362 | 183 |
| Xydar MG 450 Liquid crystal polymer/Amoco | 20 | 6 | 300 | 149 | 660–730 | 349–388 | a | a | 180–220 | 82–104 | 14.5 | 300 | 149 | 715 | 379 | 710 | 377 | 705 | 374 | 15 | 900 | 6207 | 190 | 88 |
| Zytel 101 Nylon 6/6 DuPont | 21 | 24 | 175 | 79 | 550–590 | 288 310 | 5000–20000 | 34486 137944 | 210–250 | 99–121 | 14.5 | 300 | 149 | 550 | 288 | 545 | 285 | 540 | 282 | 20 | 650 | 4483 | 180 | 82 |

Notes:
a. Not specified by manufacturer
b. Temperature was measured at the three cylinders (barrel) zones indicated. Some plastics required slightly higher barrel temperatures for best cavity fill and density.

## CHANGES IN PLASTICS IMMERSED IN 32 ISO VG MINERAL OIL

**TABLE B-1**

| NO. | TYPE | TEMPERATURE (deg. C) a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | CREAM/FAINT GREEN | -0.03 | -0.14 | 0.00 | -0.11 |
| 1 | POLYPHTHALAMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.59 | -0.54 | 0.00 | -0.34 |
| 2 | ABS | 60 | 0 | 0 | 0 | 0 | NONE | -0.08 | -0.32 | 0.00 | -0.06 |
| 2 | ABS | 100 | 0 | 0 | 0 | 0 | CREAM/WHITE COAT | -1.91 | 5.75 | 10.05 | 14.40 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | -0.13 | 0.14 | 0.00 | -0.17 |
| 3 | ACETAL | 100 | 0 | 0 | 0 | 0 | NONE | -0.28 | -0.41 | 0.79 | -0.21 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | -0.07 | 0.14 | 0.38 | -0.44 |
| 4 | PHENOLIC | 100 | 0 | 0 | 0 | 0 | NONE | -0.38 | -0.81 | -0.38 | -2.51 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.04 | -0.27 | 0.40 | -0.05 |
| 5 | POLYVINYLIDENE FLUORIDE | 100 | 0 | 0 | 0 | 0 | LUCITE/YELLOW TINT | -0.16 | -0.14 | 0.00 | 0.00 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | NONE | -0.07 | -0.11 | 0.31 | 0.03 |
| 6 | POLYCARBONATE | 100 | 0 | 0 | 0 | 0 | NONE | -0.09 | -0.68 | -0.61 | 0.03 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.17 | -0.69 | -0.62 | 0.15 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 100 | 0 | 0 | 0 | 0 | GREY/WHITE COAT | -0.14 | -0.05 | 1.24 | 2.38 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 0.40 | -0.14 | 0.78 | 1.59 |
| 8 | POLYPROPYLENE | 100 | 0 | 0 | 0 | 0 | NONE | -0.09 | 2.44 | 2.34 | 10.44 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | -0.40 | 0.00 | 0.09 |
| 9 | POLYARYL SULFONE | 100 | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.00 | -0.38 | 0.06 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | -0.40 | -0.78 | 0.02 |
| 10 | POLYETHYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.13 | -0.39 | -0.09 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.03 | -0.27 | -0.62 | 0.01 |
| 11 | POLYPHENYLENESULFIDE | 100 | 0 | 0 | 0 | 0 | CHOCOLATE/LIGHTER | -0.10 | -0.53 | -0.47 | -0.01 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 0.02 | -0.40 | 0.39 | 0.12 |
| 12 | POLYTETRAFLUOROETHYLENE | 100 | 0 | 0 | 0 | 0 | NONE | 0.02 | 0.52 | -1.49 | 0.03 |
| 13 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.03 | 0.40 | 0.39 | 0.20 |
| 13 | POLYAMIDE-IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.00 | 1.15 | 0.15 |
| 14 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.04 | -0.53 | -1.51 | 0.16 |
| 14 | POLYAMIDE-IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.14 | -0.13 | 0.00 | 0.19 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.09 | -0.32 | 0.00 | 0.01 |
| 15 | POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.02 | -0.16 | 0.00 | 0.02 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | -0.43 | 0.16 | 0.09 |
| 16 | MODIFIED POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.06 | -0.69 | 0.00 | 0.01 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.00 | 0.78 | 0.04 |
| 17 | POLYARYLETHERKETONE | 100 | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.00 | -1.15 | -0.11 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | -0.07 | -0.38 | 0.01 | 0.06 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | -0.26 | -0.22 | 0.00 | 0.05 |
| 19 | POLYIMIDE-DF | 60 | 0 | 0 | 0 | 0 | NONE | 0.04 | 0.00 | 0.96 | 0.07 |
| 19 | POLYIMIDE-DF | 100 | 0 | 0 | 0 | 0 | NONE | 0.00 | -0.15 | 0.96 | 0.02 |
| 20 | POLYIMIDE-DF-ISO | 60 | 0 | 0 | 0 | 0 | NONE | -0.03 | -0.45 | 0.00 | -0.08 |
| 20 | POLYIMIDE-DF-ISO | 100 | 1 | 0 | 0 | 0 | NONE | -0.03 | -0.45 | 0.00 | -0.25 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | 0.00 | -0.40 | 0.00 | 0.03 |
| 21 | POLY(ARYLETHERETHERKETONE) | 100 | 0 | 0 | 0 | 0 | NONE | -0.01 | -0.40 | -0.77 | -0.03 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | -0.53 | 0.00 | -0.03 |
| 22 | LIQUID CRYSTAL POLYMER | 100 | 0 | 0 | 0 | 0 | NONE | 0.00 | -0.27 | 0.00 | -0.03 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.03 | 0.14 | -0.78 | -0.04 |
| 23 | 66 NYLON, POLYAMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.20 | -0.41 | -1.16 | 0.03 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN 32 ISO VG MODIFIED POLYGLYCOL

TABLE B-2

| NO. | TYPE | TEMPERATURE (deg. C) a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.143 | -0.541 | 0.000 | -0.314 |
| 1 | POLYPHTHALAMIDE | 100 | 0 | 0 | 0 | 0 | CREAM/BURNT CREAM | -0.544 | -0.540 | 0.000 | -0.779 |
| 2 | ABS | 60 | 0 | 0 | 0 | 0 | NONE | -0.097 | 0.000 | 0.468 | -0.104 |
| 2 | ABS | 100 | 0 | 0 | 0 | 0 | NONE | -3.518 | 0.214 | 1.249 | -0.109 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | -0.160 | -0.274 | 0.000 | -0.171 |
| 3 | ACETAL | 100 | 0 | 0 | 0 | 0 | WHITE/OFF WHITE | -0.335 | -0.274 | 0.000 | -0.383 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | -0.413 | -0.538 | -0.763 | -2.373 |
| 4 | PHENOLIC | 100 | 0 | 0 | 0 | 0 | NONE | -0.370 | -0.405 | -1.148 | -2.279 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.102 | -0.541 | -0.394 | -0.008 |
| 5 | POLYVINYLIDENE FLUORIDE | 100 | 0 | 0 | 0 | 0 | LUCITE/CREAM | -0.204 | -0.407 | -0.787 | -0.010 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | NONE | -0.080 | -0.267 | 0.000 | -0.059 |
| 6 | POLYCARBONATE | 100 | 0 | 0 | 0 | 0 | NONE | -0.074 | -0.534 | -0.154 | -0.076 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.103 | -0.268 | 0.001 | 0.115 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.143 | -0.589 | 0.000 | 0.075 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | NONE | -0.158 | -0.542 | -0.781 | -0.018 |
| 8 | POLYPROPYLENE | 100 | 0 | 0 | 0 | 0 | LUCITE/MORE GRAY | -0.129 | -0.406 | -0.391 | 0.120 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | -0.085 | -0.401 | 0.000 | -0.375 |
| 9 | POLYARYL SULFONE | 100 | 0 | 0 | 0 | 0 | NONE | -0.128 | -0.267 | 0.388 | -0.414 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | -0.071 | 0.134 | 0.781 | -0.051 |
| 10 | POLYETHYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | LIGHT TAN/PALE TAN | -0.057 | -0.535 | 0.391 | -0.125 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.028 | -0.374 | -0.624 | -0.011 |
| 11 | POLYPHENYLENESULFIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.091 | -0.321 | 0.624 | -0.025 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | -0.040 | 0.416 | -1.553 | 0.099 |
| 12 | POLYTETRAFLUOROETHYLENE | 100 | 0 | 0 | 0 | 0 | NONE | -0.080 | -0.312 | -1.517 | 0.311 |
| 13 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.029 | 0.000 | 0.769 | 0.329 |
| 13 | POLYAMIDE-IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.014 | 0.000 | 1.154 | 0.172 |
| 14 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.269 | 0.766 | 0.213 |
| 14 | POLYAMIDE-IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.085 | 0.268 | -1.493 | 0.080 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.028 | -0.428 | -0.002 | -0.165 |
| 15 | POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.023 | -1.306 | 1.090 | -0.179 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.017 | -0.268 | 0.314 | -0.144 |
| 16 | MODIFIED POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.063 | -0.268 | 0.629 | -0.288 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | -0.014 | 0.136 | 1.157 | -0.097 |
| 17 | POLYARYLETHERKETONE | 100 | 0 | 0 | 0 | 0 | NONE | -0.029 | 0.136 | 0.388 | -0.194 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | -0.115 | -0.594 | 0.153 | -0.080 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | -0.271 | -0.377 | 0.157 | -0.135 |
| 19 | POLYIMIDE-DF | 60 | 0 | 0 | 0 | 0 | NONE | 0.000 | -0.149 | -0.943 | -0.265 |
| 19 | POLYIMIDE-DF | 100 | 0 | 0 | 0 | 0 | NONE | -0.015 | -0.149 | -0.476 | -0.325 |
| 20 | POLYIMIDE-DF-ISO | 60 | 0 | 0 | 0 | 0 | NONE | 1.443 | 0.152 | -0.472 | -0.439 |
| 20 | POLYIMIDE-DF-ISO | 100 | 0 | 0 | 0 | 0 | NONE | -0.059 | -0.151 | -0.467 | -0.593 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | -0.014 | -0.135 | 0.000 | -0.078 |
| 21 | POLY(ARYLETHERETHERKETONE) | 100 | 0 | 0 | 0 | 0 | NONE | -0.029 | -0.134 | 0.000 | -0.088 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | -0.014 | -0.668 | 0.000 | -0.001 |
| 22 | LIQUID CRYSTAL POLYMER | 100 | 0 | 0 | 0 | 0 | NONE | 0.014 | -0.535 | -0.388 | -0.058 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.187 | -0.271 | -0.391 | -0.298 |
| 23 | 66 NYLON, POLYAMIDE | 100 | 0 | 0 | 0 | 0 | YELLOW CREAM/BROWNE | -0.245 | -0.542 | 0.000 | -0.526 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN 32 ISO VG POLYPROPYLENE GLYCOL DIOL

**TABLE B-3**

| NO. | TYPE | TEMPERATURE (deg. C) a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | CREAM/GREEN TINT | -0.14 | -0.41 | -0.39 | -0.43 |
| 1 | POLYPHTHALAMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.49 | -0.27 | -0.39 | -0.66 |
| 2 | ABS | 60 | 0 | 0 | 0 | 0 | NONE | -0.06 | -0.11 | 0.16 | -0.12 |
| 2 | ABS | 100 | 2 | 0 | 0 | 0 | NONE | -1.73 | 0.05 | 3.42 | 3.91 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | -0.12 | -0.27 | 0.00 | -0.17 |
| 3 | ACETAL | 100 | 0 | 0 | 0 | 0 | WHITE/OFF WHITE | 0.28 | -0.27 | 0.79 | 0.47 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | -0.14 | -0.40 | -0.77 | -1.41 |
| 4 | PHENOLIC | 100 | 0 | 0 | 0 | 0 | NONE | -0.47 | -1.07 | -1.15 | -2.96 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.04 | 0.14 | -0.39 | -0.01 |
| 5 | POLYVINYLIDENE FLUORIDE | 100 | 0 | 0 | 0 | 0 | LUCITE/OFF WHITE | 0.12 | 0.27 | 0.00 | 0.26 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | CLEAR/CLOUDY | -0.03 | -0.32 | -0.15 | -0.07 |
| 6 | POLYCARBONATE | 100 | 0 | 0 | 0 | 0 | CLEAR/CLOUDY | -0.08 | 0.16 | 1.37 | 1.24 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.04 | -0.43 | 0.63 | 0.00 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.14 | -0.21 | 0.94 | 0.04 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.00 | -0.39 | 2.75 |
| 8 | POLYPROPYLENE | 100 | 0 | 0 | 0 | 0 | NONE | -0.01 | -0.27 | -0.78 | 0.34 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | -0.09 | 0.13 | 0.00 | -0.48 |
| 9 | POLYARYL SULFONE | 100 | 0 | 0 | 0 | 0 | NONE | -0.10 | -0.40 | 0.00 | -0.46 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.00 | 0.00 | -0.11 |
| 10 | POLYETHYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | -0.04 | -0.27 | -0.39 | -0.06 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.00 | -0.32 | 0.31 | -0.04 |
| 11 | POLYPHENYLENESULFIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.07 | -0.16 | 0.16 | -0.06 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | -0.02 | -0.10 | -1.19 | 0.02 |
| 12 | POLYTETRAFLUOROETHYLENE | 100 | 0 | 0 | 0 | 0 | NONE | 0.30 | 0.10 | -1.96 | 0.03 |
| 13 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.01 | -0.13 | 1.16 | 0.10 |
| 13 | POLYAMIDE-IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.13 | 0.01 | 0.18 |
| 14 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.00 | -0.01 | 0.09 |
| 14 | POLYAMIDE-IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.03 | -0.27 | -1.51 | 0.09 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.01 | -0.16 | 0.63 | -0.24 |
| 15 | POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.01 | -0.21 | 0.31 | -0.23 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.02 | -0.37 | 0.63 | -0.25 |
| 16 | MODIFIED POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | -0.04 | -0.21 | 0.16 | -0.26 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.00 | -0.39 | -0.14 |
| 17 | POLYARYLETHERKETONE | 100 | 0 | 0 | 0 | 0 | NONE | -0.06 | -0.14 | 1.17 | -0.16 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | -0.05 | -0.22 | -0.46 | -0.17 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | -0.14 | -0.59 | -0.61 | 0.03 |
| 19 | POLYIMIDE-DF | 60 | 0 | 0 | 0 | 0 | NONE | -0.03 | -0.30 | -0.93 | -0.33 |
| 19 | POLYIMIDE-DF | 100 | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.00 | 0.00 | -0.29 |
| 20 | POLYIMIDE-DF-ISO | 60 | 0 | 0 | 0 | 0 | NONE | -0.04 | -0.15 | -0.47 | -0.49 |
| 20 | POLYIMIDE-DF-ISO | 100 | 0 | 0 | 0 | 0 | NONE | -0.06 | -0.15 | -1.41 | -0.62 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | -0.10 | -0.14 | 0.00 | -0.08 |
| 21 | POLY(ARYLETHERETHERKETONE) | 100 | 0 | 0 | 0 | 0 | NONE | -0.03 | -0.27 | -0.78 | -0.08 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | 0.03 | -0.27 | 0.00 | -0.01 |
| 22 | LIQUID CRYSTAL POLYMER | 100 | 0 | 0 | 0 | 0 | NONE | 0.01 | -0.13 | 0.00 | -0.05 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | YELLOW CREAM/YELLOW | -0.19 | -0.54 | 0.00 | -0.45 |
| 23 | 66 NYLON, POLYAMIDE | 100 | 0 | 0 | 0 | 0 | YELLOW CREAM/YELLOW | -0.23 | -0.41 | -0.39 | -0.50 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN 32 ISO VG BRANCHED ACID POLYOL ESTER

**TABLE B-4**

| NO. | TYPE | TEMPERATURE (deg. C) a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | CREAM/GREEN TINT | −0.03 | 0.135 | 0.000 | 0.006 |
| 1 | POLYPHTHALAMIDE | 100 | 0 | 0 | 0 | 0 | CREAM/DULL CREAM | −0.49 | −0.135 | 0.391 | −0.263 |
| 2 | ABS | 60 | 0 | 0 | 0 | 0 | NONE | −0.119 | −0.053 | −0.463 | −0.099 |
| 2 | ABS | 100 | 0 | 0 | 0 | 0 | CREAM/FLESH CREAM | −2.231 | 0.748 | 5.451 | 5.319 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | −0.044 | 0.137 | 0.787 | −0.114 |
| 3 | ACETAL | 100 | 0 | 0 | 0 | 0 | NONE | −0.160 | 0.000 | 0.394 | −0.221 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | −0.100 | −0.402 | −0.382 | −0.740 |
| 4 | PHENOLIC | 100 | 0 | 0 | 0 | 0 | NONE | −0.527 | −0.270 | 0.003 | −3.182 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.058 | 0.272 | 0.000 | 0.000 |
| 5 | POLYVINYLIDENE FLUORIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.055 | −0.135 | 0.000 | 0.143 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | NONE | −0.028 | −0.801 | 0.000 | 0.009 |
| 6 | POLYCARBONATE | 100 | 0 | 0 | 0 | 0 | NONE | −0.057 | −1.181 | 0.000 | 0.777 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.536 | 0.394 | −0.010 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 100 | 0 | 0 | 0 | 0 | GRAY/CLOUDY GRAY | −0.100 | 0.134 | 1.169 | 0.568 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 0.029 | 0.410 | 0.787 | 0.073 |
| 8 | POLYPROPYLENE | 100 | 0 | 0 | 0 | 0 | NONE | 0.705 | 0.407 | 0.000 | 2.625 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.000 | −0.401 | −0.388 | 0.030 |
| 9 | POLYARYL SULFONE | 100 | 0 | 0 | 0 | 0 | NONE | −0.014 | −0.133 | −0.772 | −0.122 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | −0.028 | 0.404 | −0.388 | −0.032 |
| 10 | POLYETHYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | −0.028 | 0.000 | −0.778 | −0.083 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.268 | 0.944 | −0.023 |
| 11 | POLYPHENYLENESULFIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.102 | 0.214 | 0.001 | −0.009 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 0.140 | 1.140 | 0.000 | 0.004 |
| 12 | POLYTETRAFLUOROETHYLENE | 100 | 0 | 0 | 0 | 0 | NONE | 0.180 | 0.403 | 0.442 | 0.629 |
| 13 | POLYAMIDE−IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.029 | 0.135 | 0.000 | 0.251 |
| 13 | POLYAMIDE−IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.135 | 1.163 | 0.048 |
| 14 | POLYAMIDE−IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.029 | 0.135 | −0.382 | 0.224 |
| 14 | POLYAMIDE−IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.043 | 0.134 | 0.382 | 0.052 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.091 | −0.641 | 0.314 | −0.045 |
| 15 | POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.034 | −0.214 | 0.000 | −0.131 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.028 | −0.428 | 0.156 | 0.006 |
| 16 | MODIFIED POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.080 | −0.106 | 0.469 | −0.040 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | −0.014 | −0.001 | 0.794 | −0.135 |
| 17 | POLYARYLETHERKETONE | 100 | 0 | 0 | 0 | 0 | NONE | −0.058 | −0.001 | 0.000 | −0.199 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.023 | 0.054 | −0.429 | −0.022 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | −0.184 | −0.054 | 0.308 | −0.067 |
| 19 | POLYIMIDE−DF | 60 | 0 | 0 | 0 | 0 | NONE | 0.015 | 0.000 | 0.000 | 0.064 |
| 19 | POLYIMIDE−DF | 100 | 0 | 0 | 0 | 0 | NONE | 0.029 | −0.149 | 0.962 | −0.154 |
| 20 | POLYIMIDE−DF−ISO | 60 | 0 | 0 | 0 | 0 | NONE | −0.015 | 0.000 | −0.476 | −0.298 |
| 20 | POLYIMIDE−DF−ISO | 100 | 0 | 0 | 0 | 0 | NONE | −0.074 | 0.000 | 0.485 | −0.613 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | 0.000 | −0.270 | −0.385 | 0.030 |
| 21 | POLY(ARYLETHERETHERKETONE) | 100 | 0 | 0 | 0 | 0 | NONE | −0.057 | 0.000 | −0.772 | 0.007 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | 0.042 | 0.135 | 0.391 | −0.008 |
| 22 | LIQUID CRYSTAL POLYMER | 100 | 0 | 0 | 0 | 0 | NONE | −0.014 | 0.403 | 0.000 | −0.020 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.000 | −1.136 | 0.027 |
| 23 | 66 NYLON, POLYAMIDE | 100 | 0 | 0 | 0 | 0 | YELLOW CREAM/DARKER | −0.173 | −0.135 | 0.000 | −0.147 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN 22 ISO VG POLYOL MIXED–ACID ESTER

TABLE B–5

| NO. | TYPE | TEMPERATURE (deg. C) a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | CREAM/GREEN TINT | −0.19 | −0.27 | −0.39 | −0.32 |
| 1 | POLYPHTHALAMIDE | 100 | 0 | 0 | 0 | 0 | CREAM/GREEN TINT | −0.07 | −0.27 | −0.39 | −0.79 |
| 2 | ABS | 60 | 0 | 0 | 0 | 0 | CREAM/WHITE FILM | −0.10 | −0.16 | 0.62 | −0.03 |
| 2 | ABS | 100 | 2 | 0 | 0 | 0 | CREAM/OFF WHITE | −2.11 | 2.51 | 10.56 | 13.17 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | −0.23 | −0.41 | 0.00 | −0.24 |
| 3 | ACETAL | 100 | 0 | 0 | 0 | 0 | NONE | −0.23 | −0.14 | 0.39 | −0.26 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | −0.10 | −0.13 | −0.38 | −0.76 |
| 4 | PHENOLIC | 100 | 0 | 0 | 0 | 0 | NONE | −0.51 | 0.13 | −0.77 | −2.92 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.10 | −0.41 | 0.79 | −0.01 |
| 5 | POLYVINYLIDENE FLUORIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.10 | −0.54 | 0.79 | 0.07 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | NONE | −0.09 | −0.21 | −0.15 | −0.02 |
| 6 | POLYCARBONATE | 100 | 0 | 0 | 0 | 0 | CLEAR/FOGGY | −0.07 | −0.42 | 1.53 | 0.80 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.06 | −0.32 | 1.25 | 0.13 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.11 | 0.21 | 2.34 | 1.91 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | NONE | −0.06 | −0.54 | 0.39 | 0.28 |
| 8 | POLYPROPYLENE | 100 | 0 | 0 | 0 | 0 | NONE | 0.49 | 0.14 | 0.39 | 1.97 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | −0.04 | −0.67 | −0.38 | −0.29 |
| 9 | POLYARYL SULFONE | 100 | 0 | 0 | 0 | 0 | NONE | 0.04 | −0.40 | 0.00 | −0.52 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | −0.01 | −0.40 | −0.39 | −0.09 |
| 10 | POLYETHYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | −0.01 | −0.54 | −0.39 | −0.15 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.01 | −0.27 | −0.16 | 0.00 |
| 11 | POLYPHENYLENESULFIDE | 100 | 0 | 0 | 0 | 0 | CHOCOLATE/LIGHTER | −0.07 | −0.37 | 0.16 | −0.01 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | −0.04 | 0.00 | −1.25 | 0.22 |
| 12 | POLYTETRAFLUOROETHYLENE | 100 | 0 | 0 | 0 | 0 | NONE | 0.08 | 0.00 | 0.00 | 0.04 |
| 13 | POLYAMIDE–IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.27 | 1.16 | 0.25 |
| 13 | POLYAMIDE–IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.00 | −0.38 | 0.11 |
| 14 | POLYAMIDE–IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.00 | 0.38 | 0.17 |
| 14 | POLYAMIDE–IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.00 | −0.38 | 0.08 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.03 | −0.48 | 0.63 | −0.07 |
| 15 | POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.09 | −0.43 | 0.00 | −0.12 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.05 | −0.32 | −0.31 | −0.12 |
| 16 | MODIFIED POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.08 | −0.53 | 0.16 | −0.17 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | −0.01 | −0.14 | 0.78 | −0.23 |
| 17 | POLYARYLETHERKETONE | 100 | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.14 | 0.39 | −0.19 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | −0.16 | −0.32 | 0.16 | −0.05 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | −0.30 | −0.65 | 0.00 | −0.10 |
| 19 | POLYIMIDE–DF | 60 | 0 | 0 | 0 | 0 | NONE | −0.04 | −0.15 | −1.43 | −0.22 |
| 19 | POLYIMIDE–DF | 100 | 0 | 0 | 0 | 0 | NONE | −0.03 | 0.00 | −0.47 | −0.32 |
| 20 | POLYIMIDE–DF–ISO | 60 | 0 | 0 | 0 | 0 | NONE | −0.06 | −0.15 | −0.48 | −0.41 |
| 20 | POLYIMIDE–DF–ISO | 100 | 0 | 0 | 0 | 0 | NONE | −0.07 | −0.15 | −0.95 | −0.56 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | −0.54 | −0.39 | −0.06 |
| 21 | POLY(ARYLETHERETHERKETONE) | 100 | 0 | 0 | 0 | 0 | NONE | −0.01 | −0.40 | 0.39 | −0.09 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | 0.03 | 0.00 | −0.39 | −0.01 |
| 22 | LIQUID CRYSTAL POLYMER | 100 | 0 | 0 | 0 | 0 | NONE | 0.00 | −0.13 | 0.00 | −0.06 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.13 | −0.41 | −0.39 | −0.25 |
| 23 | 66 NYLON, POLYAMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.29 | −0.27 | −0.39 | −0.63 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN 32 ISO VG POLYPROPYLENE GLYCOL BUTYL MONO ETHER

**TABLE B-6**

| NO. | TYPE | TEMPERATURE (deg. C) a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | CREAM/GREEN TINT | −0.04 | −0.13 | 0.00 | −0.02 |
| 1 | POLYPHTHALAMIDE | 100 | 0 | 0 | 0 | 0 | CREAM/DULL CREAM | −0.40 | −0.27 | 0.00 | −0.37 |
| 2 | ABS | 60 | 0 | 0 | 0 | 0 | NONE | −0.13 | −0.32 | 0.16 | −0.14 |
| 2 | ABS | 100 | 0 | 0 | 0 | 0 | CREAM/FLESH | −4.14 | 0.21 | 0.46 | 0.11 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | −0.06 | −0.06 | 0.00 | −0.12 |
| 3 | ACETAL | 100 | 0 | 0 | 0 | 0 | NONE | −0.19 | −0.14 | 0.00 | −0.25 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | −0.31 | −0.14 | −0.38 | −2.01 |
| 4 | PHENOLIC | 100 | 0 | 0 | 0 | 0 | NONE | −0.37 | −0.54 | −0.76 | −2.00 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.06 | −0.14 | 0.00 | −0.01 |
| 5 | POLYVINYLIDENE FLUORIDE | 100 | 0 | 0 | 0 | 0 | LUCITE/DULLER | −0.07 | −0.14 | −0.39 | 0.02 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | NONE | −0.11 | −0.27 | −0.74 | 0.18 |
| 6 | POLYCARBONATE | 100 | 0 | 0 | 0 | 0 | NONE | −0.13 | −0.32 | 0.30 | 0.20 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.13 | 0.11 | 0.63 | 0.00 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 100 | 0 | 0 | 0 | 0 | GRAY/CLOUDY | −0.07 | 0.43 | 1.25 | 0.85 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 0.98 | 0.00 | 0.00 | 0.02 |
| 8 | POLYPROPYLENE | 100 | 0 | 0 | 0 | 0 | NONE | 0.22 | 0.14 | 0.00 | 0.40 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | −0.67 | −0.38 | −0.08 |
| 9 | POLYARYL SULFONE | 100 | 0 | 0 | 0 | 0 | NONE | 0.04 | −0.40 | −0.39 | −0.06 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | −0.01 | 0.00 | 0.00 | −0.01 |
| 10 | POLYETHYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | −0.06 | 0.00 | 0.00 | −0.08 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.05 | 0.31 | −0.03 |
| 11 | POLYPHENYLENESULFIDE | 100 | 0 | 0 | 0 | 0 | CHOCOLATE/LIGHTER | −0.10 | 0.05 | 0.31 | −0.01 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 0.08 | 0.51 | 0.38 | 0.04 |
| 12 | POLYTETRAFLUOROETHYLENE | 100 | 0 | 0 | 0 | 0 | NONE | 0.30 | 0.00 | 1.64 | 1.19 |
| 13 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.14 | 0.77 | 0.05 |
| 13 | POLYAMIDE-IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | 0.03 | 0.13 | 0.00 | 0.07 |
| 14 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.13 | 0.00 | 0.13 |
| 14 | POLYAMIDE-IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.40 | −0.76 | 0.12 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.01 | −0.27 | −0.31 | 0.43 |
| 15 | POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.10 | −0.32 | −0.15 | −0.01 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | −0.16 | −0.31 | −0.05 |
| 16 | MODIFIED POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.03 | −0.32 | 0.16 | −0.05 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | −0.01 | 0.00 | 0.39 | −0.15 |
| 17 | POLYARYLETHERKETONE | 100 | 0 | 0 | 0 | 0 | NONE | −0.01 | 0.00 | −1.15 | −0.16 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | −0.06 | 0.11 | 0.00 | −0.05 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | −0.18 | −0.05 | 0.30 | −0.05 |
| 19 | POLYIMIDE-DF | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.30 | 0.00 | −0.04 |
| 19 | POLYIMIDE-DF | 100 | 0 | 0 | 0 | 0 | NONE | 0.00 | −0.15 | 1.44 | −0.11 |
| 20 | POLYIMIDE-DF-ISO | 60 | 0 | 0 | 0 | 0 | NONE | −0.04 | −0.15 | 1.46 | −0.56 |
| 20 | POLYIMIDE-DF-ISO | 100 | 0 | 0 | 0 | 0 | NONE | −0.03 | 0.00 | −1.43 | −0.34 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | −0.01 | −0.13 | −0.77 | 0.00 |
| 21 | POLY(ARYLETHERETHERKETONE) | 100 | 0 | 0 | 0 | 0 | NONE | −0.03 | 0.00 | 0.00 | 0.00 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | 0.06 | 0.27 | 0.00 | −0.01 |
| 22 | LIQUID CRYSTAL POLYMER | 100 | 0 | 0 | 0 | 0 | NONE | 0.00 | −0.13 | 0.39 | −0.02 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.03 | −0.14 | 0.00 | −0.03 |
| 23 | 66 NYLON, POLYAMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.14 | −0.14 | −0.78 | −0.18 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN 32 ISO VG ALKYLBENZENE

**TABLE B-7**

| NO. | TYPE | TEMPERATURE a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | CREAM/GEEEN TINT | −0.09 | −0.27 | 0.00 | −0.08 |
| 1 | POLYPHTHALAMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.69 | −0.27 | −0.39 | −0.51 |
| 2 | ABS | 60 | 0 | 0 | 0 | 0 | NONE | −0.09 | −0.13 | 0.78 | −0.13 |
| 2 | ABS | 100 | 1 | 0 | 0 | 0 | CREAM/OFF WHITE ENDS | −2.69 | 3.07 | 3.40 | 5.57 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | −0.22 | −0.68 | 0.00 | −0.15 |
| 3 | ACETAL | 100 | 0 | 0 | 0 | 0 | NONE | −0.57 | −0.55 | 0.39 | −0.58 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | −0.01 | −0.27 | 0.00 | −0.15 |
| 4 | PHENOLIC | 100 | 0 | 0 | 0 | 0 | NONE | −0.40 | −0.54 | 0.00 | −2.62 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | 2.90 | 1.22 | 0.40 | 2.96 |
| 5 | POLYVINYLIDENE FLUORIDE | 100 | 0 | 0 | 0 | 0 | LUCITE/YELLOW TINT | 2.83 | 1.49 | −1.50 | 2.82 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | NONE | −0.09 | −0.05 | −0.15 | 0.02 |
| 6 | POLYCARBONATE | 100 | 0 | 0 | 0 | 0 | NONE | −0.12 | 0.11 | 0.16 | 0.02 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.08 | −0.16 | 0.00 | 0.07 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 100 | 0 | 0 | 0 | 0 | GREY/WHITE COAT | −0.01 | 1.23 | 5.46 | 5.49 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 0.40 | 0.14 | −4.44 | 1.53 |
| 8 | POLYPROPYLENE | 100 | 0 | 0 | 0 | 0 | NONE | 2.83 | 3.12 | 3.1[illegible] | 8.83 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | −0.53 | 0.78 | 0.40 |
| 9 | POLYARYL SULFONE | 100 | 0 | 0 | 0 | 0 | NONE | 0.03 | −0.40 | 0.78 | 0.09 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | −0.01 | −0.27 | 0.00 | −0.07 |
| 10 | POLYETHYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | −0.04 | −0.40 | −0.39 | −0.14 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | NONE | −2.75 | −0.80 | −3.82 | −2.88 |
| 11 | POLYPHENYLENESULFIDE | 100 | 0 | 0 | 0 | 0 | CHOCOLATE/LIGHTER | −3.05 | −1.60 | −5.54 | −2.83 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 0.02 | −0.20 | −0.04 | −0.04 |
| 12 | POLYTETRAFLUOROETHYLENE | 100 | 0 | 0 | 0 | 0 | NONE | 0.00 | −0.51 | −1.96 | 0.00 |
| 13 | POLYAMIDE−IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.03 | 0.13 | 1.92 | 0.24 |
| 13 | POLYAMIDE−IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.01 | 0.13 | −0.38 | 0.13 |
| 14 | POLYAMIDE−IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.00 | 0.00 | 0.20 |
| 14 | POLYAMIDE−IMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.03 | 0.00 | −0.37 | 0.10 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.04 | −0.48 | 0.31 | 0.12 |
| 15 | POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.07 | −0.69 | 0.94 | 0.07 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.06 | 0.16 | 0.31 | 0.01 |
| 16 | MODIFIED POLYETHERIMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.16 | −0.43 | −2.28 | −0.24 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.14 | 0.00 | −0.03 |
| 17 | POLYARYLETHERKETONE | 100 | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.14 | 1.17 | −0.13 |
| 18 | POLYBUTYLENE TEREPHTAHLATE | 60 | 0 | 0 | 0 | 0 | NONE | −0.10 | −0.13 | 0.00 | −0.02 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 100 | 0 | 0 | 0 | 0 | NONE | −0.19 | −0.27 | −0.76 | −0.08 |
| 19 | POLYIMIDE−DF | 60 | 0 | 0 | 0 | 0 | NONE | −0.01 | −0.30 | −0.48 | −0.05 |
| 19 | POLYIMIDE−DF | 100 | 0 | 0 | 0 | 0 | NONE | −0.04 | −0.15 | −0.94 | 0.01 |
| 20 | POLYIMIDE−DF−ISO | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.00 | 1.44 | −0.06 |
| 20 | POLYIMIDE−DF−ISO | 100 | 0 | 0 | 0 | 0 | NONE | −0.06 | 0.00 | −0.96 | −0.54 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | −0.04 | −0.40 | 0.00 | 0.04 |
| 21 | POLY(ARYLETHERETHERKETONE) | 100 | 0 | 0 | 0 | 0 | NONE | −0.06 | −0.54 | −0.39 | −0.02 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.00 | −1.89 | 0.00 |
| 22 | LIQUID CRYSTAL POLYMER | 100 | 0 | 0 | 0 | 0 | NONE | −0.07 | 0.27 | −2.28 | −0.05 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.14 | −0.27 | −0.39 | −0.08 |
| 23 | 66 NYLON, POLYAMIDE | 100 | 0 | 0 | 0 | 0 | NONE | −0.22 | −0.14 | −0.39 | −0.12 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, 100 deg.C = 212 deg.F
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN HCFC-22 (R-22)

**TABLE C-1**

| NO. | TYPE | TEMPERATURE Deg. C a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. | AVERAGE% 24 HR WT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.084 | 0.135 | −0.388 | 0.841 | 0.722 |
| 1 | POLYPHTHALAMIDE | 60 | 1 | 0 | 0 | 0 | YELLOW/OFF WHITE | −0.469 | 0.135 | 0.781 | 2.126 | 2.041 |
| 2 | ABS | RT | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 2 | ABS | 60 | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 3 | ACETAL | RT | 0 | 0 | 0 | 0 | NONE | 0.087 | 0.274 | 3.165 | 0.672 | 0.494 |
| 3 | ACETAL | 60 | 1 | 0 | 0 | 1 | NONE | 2.626 | 2.470 | 0.000 | 8.085 | 3.641 |
| 4 | PHENOLIC | RT | 0 | 0 | 0 | 0 | NONE | 0.171 | 0.537 | 3.462 | 1.236 | 1.044 |
| 4 | PHENOLIC | 60 | 2 | 0 | 0 | 0 | NONE | 0.399 | 0.941 | 0.373 | 2.207 | 1.980 |
| 5 | POLYVINYLIDENE FLUORIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.108 | 0.272 | −0.348 | 0.607 | 0.522 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 1 | 0 | 0 | 1 | NONE | 3.094 | 2.978 | 2.390 | 7.929 | 5.422 |
| 6 | POLYCARBONATE | RT | 2 | 0 | 0 | 0 | CLEAR/CLOUDY | −0.754 | 2.267 | 25.185 | 28.097 | 18.217 |
| 6 | POLYCARBONATE | 60 | 1 | 2 | 2 | 2 | CLEAR/CLOUDY | −1.123 | 3.338 | 21.240 | 20.607 | 13.685 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | RT | 2 | 0 | 0 | 0 | NONE | −1.442 | 3.091 | 15.955 | 27.090 | 17.905 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 1 | 0 | 0 | 2 | NONE | −1.741 | 0.536 | 51.759 | 25.209 | 16.640 |
| 8 | POLYPROPYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.127 | 0.412 | 0.400 | 1.117 | 0.956 |
| 8 | POLYPROPYLENE | 60 | 2 | 0 | 0 | 1 | LUCITE/CLOUDY | 9.133 | 0.538 | −0.388 | 8.656 | 3.252 |
| 9 | POLYARYL SULFONE | RT | 0 | 0 | 0 | 0 | NONE | 0.114 | 0.937 | 1.947 | 1.916 | 0.626 |
| 9 | POLYARYL SULFONE | 60 | 1 | 0 | 0 | 0 | TAN/METALLIC TAN | 0.100 | 0.802 | 0.769 | 5.119 | 4.183 |
| 10 | POLYETHYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | LT.TAN/WHITE EDGES | 0.000 | 0.938 | 2.359 | 3.082 | 2.898 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 2 | 0 | 0 | 0 | LT.TAN/WHITE EDGES | 0.255 | 1.203 | 6.278 | 8.456 | 7.158 |
| 11 | POLYPHENYLENESULFIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.134 | −0.391 | 0.143 | 0.104 |
| 11 | POLYPHENYLENESULFIDE | 60 | 1 | 0 | 0 | 0 | CHOCOLATE/LIGHTER | 0.057 | 0.000 | −0.769 | 0.254 | 0.237 |
| 12 | POLYTETRAFLUOROETHYLENE | RT | 0 | 0 | 0 | 0 | NONE | 1.667 | −0.185 | 0.952 | 5.709 | 2.180 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 1.621 | 1.219 | 2.794 | 4.085 | 2.355 |
| 13 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.099 | 0.002 | 1.163 | 1.126 | 1.036 |
| 13 | POLYAMIDE-IMIDE | 60 | 1 | 0 | 0 | 0 | NONE | 0.002 | 0.267 | 0.000 | 0.594 | 0.630 |
| 14 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.071 | 0.403 | −0.388 | 0.885 | 0.810 |
| 14 | POLYAMIDE-IMIDE | 60 | 1 | 0 | 0 | 0 | NONE | 0.014 | −0.267 | 0.385 | 0.589 | 0.586 |
| 15 | POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.086 | 1.477 | 3.888 | 6.674 | 5.202 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | BROWN/METALLIC GOLD | 0.612 | 0.799 | 1.163 | 6.207 | 5.056 |
| 16 | MODIFIED POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | −0.011 | 1.072 | 2.028 | 7.070 | 5.248 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 1 | 0 | 0 | 0 | BROWN/METALLIC GOLD | 0.008 | 0.748 | 2.327 | 6.092 | 4.684 |
| 17 | POLYARYLETHERKETONE | RT | 0 | 0 | 0 | 0 | NONE | 0.001 | 0.001 | −2.267 | 0.158 | 0.128 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.027 | 0.946 | −2.593 | 0.292 | 0.281 |
| 18 | POLYBUTYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.849 | 1.220 | −0.732 | 8.194 | 6.132 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 1 | 0 | 0 | 2 | NONE | 2.880 | 2.965 | 5.829 | 12.664 | 9.822 |
| 19 | POLYIMIDE-DF | RT | 0 | 0 | 0 | 0 | NONE | 0.523 | 0.745 | 0.481 | 4.895 | 3.658 |
| 19 | POLYIMIDE-DF | 60 | 1 | 0 | 0 | 0 | NONE | 0.450 | 0.446 | −5.788 | 3.278 | 2.714 |
| 20 | POLYIMIDE-DF-ISO | RT | 0 | 0 | 0 | 0 | NONE | 0.147 | 0.000 | −1.433 | 1.004 | 0.839 |
| 20 | POLYIMIDE-DF-ISO | 60 | 1 | 0 | 0 | 0 | NONE | 0.059 | 0.303 | −5.786 | 0.292 | 0.321 |
| 21 | POLY(ARYLETHERETHERKETONE) | RT | 0 | 0 | 0 | 0 | NONE | 0.043 | 0.406 | 6.299 | 0.247 | 0.141 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | 0.029 | 0.135 | 0.784 | 0.380 | 0.364 |
| 22 | LIQUID CRYSTAL POLYMER | RT | 0 | 0 | 0 | 0 | NONE | −0.028 | 0.269 | 2.332 | 0.299 | 0.047 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 1 | 0 | 0 | 0 | NONE | 0.028 | 0.000 | 1.186 | 0.052 | 0.057 |
| 23 | 66 NYLON, POLYAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.159 | 0.543 | −0.388 | 1.504 | 1.338 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.634 | 1.083 | 0.787 | 3.502 | 3.389 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, RT = ambient
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN HFC-32 (R-32)

TABLE C-2

| NO. | TYPE | TEMPERATURE a. | FARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. | AVERAGE% 24 HR. WT. CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.035 | 0.405 | 0.794 | 0.283 | 0.288 |
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | YELLOW/OFF WHITE | 0.422 | 0.548 | 4.694 | 2.208 | 1.074 |
| 2 | ABS | RT | 0 | 0 | 0 | 2 | CREAM/LIGHT CREAM | 11.655 | 50.535 | 181.722 | 18.400 | 8.141 |
| 2 | ABS | 60 | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 3 | ACETAL | RT | 0 | 0 | 0 | 0 | NONE | 1.544 | 1.646 | 1.587 | 3.864 | 2.154 |
| 3 | ACETAL | 60 | 1 | 0 | 0 | 0 | NONE | 1.325 | 1.505 | 2.362 | 3.951 | 1.735 |
| 4 | PHENOLIC | RT | 0 | 0 | 0 | 0 | NONE | 0.028 | -0.267 | -0.775 | 0.265 | 0.223 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | -0.057 | -0.134 | -0.758 | 0.353 | 0.275 |
| 5 | POLYVINYLIDENE FLUORIDE | RT | 0 | 0 | 0 | 0 | NONE | 2.542 | 2.578 | 1.200 | 5.945 | 3.433 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 2 | NONE | 1.974 | 5.827 | 7.099 | 9.259 | 4.118 |
| 6 | POLYCARBONATE | RT | 0 | 0 | 0 | 0 | NONE | 0.468 | 2.006 | 4.261 | 10.135 | 7.643 |
| 6 | POLYCARBONATE | 60 | 1 | 0 | 0 | 0 | CLEAR/PEARL | -1.764 | -0.668 | 13.588 | 9.007 | 7.498 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | RT | 0 | 0 | 0 | 0 | NONE | 1.071 | 2.145 | 3.510 | 7.591 | 5.078 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 2 | 0 | 0 | 0 | NONE | -1.071 | 1.740 | 4.234 | 7.657 | 5.238 |
| 8 | POLYPROPYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.669 | 0.271 | 0.794 | 1.994 | 1.386 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | LUCITE/WHITE CENTER | 0.395 | 0.675 | 0.787 | 2.307 | 1.212 |
| 9 | POLYARYL SULFONE | RT | 0 | 0 | 0 | 0 | NONE | 0.329 | 0.399 | 2.353 | 3.856 | 2.945 |
| 9 | POLYARYL SULFONE | 60 | 1 | 2 | 0 | 0 | NONE | 0.598 | 1.337 | 3.504 | 5.301 | 4.377 |
| 10 | POLYETHYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.043 | 0.402 | 1.978 | 1.810 | 1.450 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | TAN/OFF WHITE | 0.028 | 0.401 | 2.734 | 3.965 | 3.424 |
| 11 | POLYPHENYLENESULFIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.535 | 0.018 | 0.319 | 0.241 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | CHOCOLATE/LIGHTER | -0.085 | -0.134 | 1.154 | 0.438 | 0.390 |
| 12 | POLYTETRAFLUOROETHYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.622 | 0.413 | 3.051 | 1.451 | 0.771 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 0.723 | 0.725 | 0.362 | 1.636 | 0.735 |
| 13 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.014 | -0.267 | 1.550 | 0.285 | 0.290 |
| 13 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.083 | -0.133 | 0.382 | 0.509 | 0.456 |
| 14 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | -0.029 | 0.000 | 0.787 | 0.289 | 0.265 |
| 14 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.043 | -0.134 | 1.151 | 0.558 | 0.528 |
| 15 | POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.100 | 0.667 | -1.113 | 2.442 | 1.890 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.271 | 0.534 | 1.163 | 4.039 | 3.447 |
| 16 | MODIFIED POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.170 | 0.803 | 1.259 | 2.758 | 2.095 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.334 | 0.534 | 2.503 | 4.417 | 3.747 |
| 17 | POLYARYLETHERKETONE | RT | 0 | 0 | 0 | 0 | NONE | 0.294 | 0.541 | 0.391 | 0.410 | 0.315 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | -0.144 | 0.270 | 0.791 | 1.213 | 1.055 |
| 18 | POLYBUTYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 1 | NONE | 0.302 | 0.947 | 2.353 | 2.206 | 1.795 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 1 | NONE | 1.122 | 0.672 | 3.113 | 2.545 | 3.877 |
| 19 | POLYIMIDE-DF | RT | 0 | 0 | 0 | 0 | NONE | 0.537 | 0.892 | 1.942 | 5.553 | 4.069 |
| 19 | POLYIMIDE-DF | 60 | 0 | 0 | 0 | 0 | NONE | 1.364 | 1.488 | 1.442 | 6.019 | 4.619 |
| 20 | POLYIMIDE-DF-ISO | RT | 0 | 0 | 0 | 0 | NONE | 0.088 | 0.000 | 1.475 | 0.864 | 0.738 |
| 20 | POLYIMIDE-DF-ISO | 60 | 0 | 0 | 0 | 0 | NONE | 0.280 | 0.453 | 0.966 | 1.467 | 1.334 |
| 21 | POLY(ARYLETHERETHERKETONE) | RT | 0 | 0 | 0 | 0 | NONE | -0.071 | 0.404 | 0.018 | 0.473 | 0.382 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | 0.143 | 0.270 | 0.784 | 1.515 | 1.328 |
| 22 | LIQUID CRYSTAL POLYMER | RT | 0 | 0 | 0 | 0 | NONE | -0.014 | 0.134 | -0.379 | 0.062 | 0.050 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | -0.042 | -0.402 | 1.572 | 0.098 | 0.079 |
| 23 | 66 NYLON, POLYAMIDE | RT | 1 | 0 | 0 | 0 | NONE | 1.484 | 0.136 | 0.794 | 0.193 | 0.204 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.288 | 0.405 | 1.163 | 1.479 | 1.410 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, RT = ambient
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN HCFC-123 (R-123)

**TABLE C-3**

| NO. | TYPE | TEMPERATURE Deg. C a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. | AVERAGE% 24 HR WT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | RT | 0 | 0 | 0 | 0 | NONE | -0.029 | 0.813 | -1.556 | -0.069 | -0.061 |
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.053 | 0.678 | -1.917 | 2.187 | 2.045 |
| 2 | ABS | RT | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 2 | ABS | 60 | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 3 | ACETAL | RT | 0 | 0 | 0 | 0 | NONE | 0.160 | -0.137 | -1.181 | 0.649 | 0.502 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | 3.194 | 3.151 | 0.787 | 9.294 | 6.617 |
| 4 | PHENOLIC | RT | 0 | 0 | 0 | 0 | NONE | 0.329 | -0.668 | 0.000 | 6.241 | 6.266 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | 0.028 | -0.133 | -0.009 | 0.818 | 0.716 |
| 5 | POLYVINYLIDENE FLUORIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.116 | 0.409 | 0.797 | 0.118 | -0.167 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.823 | 0.137 | -2.362 | 1.582 | 1.421 |
| 6 | POLYCARBONATE | RT | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 6 | POLYCARBONATE | 60 | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 7 | MODIFIED POLYPHENYLENE OXIDE | RT | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 8 | POLYPROPYLENE | RT | 0 | 0 | 0 | 0 | NONE | 1.166 | 0.816 | 1.569 | 6.854 | 5.272 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 1.770 | 2.988 | -0.391 | 14.309 | 8.038 |
| 9 | POLYARYL SULFONE | RT | 0 | 0 | 0 | 0 | NONE | 0.100 | 0.535 | -0.775 | -0.270 | -0.247 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.114 | 0.268 | -1.163 | 0.778 | 0.572 |
| 10 | POLYETHYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | LT. TAN/WHITE EDGES | 0.014 | 0.134 | 1.563 | 0.154 | -0.463 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | LT. TAN/WHITE EDGES | 0.099 | 1.745 | 0.781 | 4.530 | 3.773 |
| 11 | POLYPHENYLENESULFIDE | RT | 0 | 0 | 0 | 0 | NONE | -0.014 | 0.134 | 0.784 | -0.005 | -0.009 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.057 | -0.401 | -2.734 | 0.129 | 0.109 |
| 12 | POLYTETRAFLUOROETHYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.622 | 0.000 | -1.136 | 2.473 | 2.078 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 1.803 | 1.421 | -1.168 | 4.903 | 4.063 |
| 13 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | -0.014 | -0.401 | 1.154 | -0.019 | 0.052 |
| 13 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.591 | 0.806 | -1.938 | 0.509 | 0.633 |
| 14 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | -0.028 | -0.268 | 2.713 | -0.023 | 0.047 |
| 14 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.000 | -0.402 | -1.533 | 0.375 | 0.465 |
| 15 | POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | -0.071 | 0.001 | -0.778 | -0.178 | -0.118 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.071 | 0.003 | -0.388 | 0.752 | 0.575 |
| 16 | MODIFIED POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | -0.028 | 0.161 | -0.465 | -0.150 | -0.118 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.040 | 0.912 | -0.780 | 0.686 | 0.549 |
| 17 | POLYARYLETHERKETONE | RT | 0 | 0 | 0 | 0 | NONE | 0.043 | -0.136 | -0.781 | -0.086 | -0.049 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | 1.204 | 0.813 | 0.775 | 0.099 | 0.060 |
| 18 | POLYBUTYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.136 | 1.163 | 1.510 | 1.237 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.863 | 1.081 | 1.145 | 7.023 | 6.281 |
| 19 | POLYIMIDE-DF | RT | 0 | 0 | 0 | 0 | NONE | -0.116 | -0.298 | -1.909 | -0.100 | -0.091 |
| 19 | POLYIMIDE-DF | 60 | 0 | 0 | 0 | 0 | NONE | 0.102 | -0.149 | -0.952 | 0.663 | 0.608 |
| 20 | POLYIMIDE-DF-ISO | RT | 0 | 0 | 0 | 0 | NONE | 0.015 | 0.000 | -0.966 | -0.163 | -0.125 |
| 20 | POLYIMIDE-DF-ISO | 60 | 0 | 0 | 0 | 0 | NONE | 0.074 | -0.302 | -1.905 | 0.265 | 0.265 |
| 21 | POLY(ARYLETHERETHERKETONE) | RT | 0 | 0 | 0 | 0 | NONE | -0.057 | 0.000 | -1.563 | -0.075 | -0.050 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | 0.014 | -0.134 | -1.544 | 0.020 | 0.023 |
| 22 | LIQUID CRYSTAL POLYMER | RT | 0 | 0 | 0 | 0 | NONE | -0.028 | -0.134 | -0.388 | 0.005 | 0.003 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | -0.014 | -0.669 | -0.781 | 0.048 | 0.051 |
| 23 | 66 NYLON, POLYAMIDE | RT | 0 | 0 | 0 | 0 | NONE | -0.058 | 0.542 | -1.929 | -0.261 | -0.190 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.462 | 1.085 | -1.903 | 2.305 | 2.216 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, RT = ambient
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN HCFC-124 (R-124)

TABLE C-4

| NO. | TYPE | TEMPERATURE Deg. C. a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. | AVERAGE% 24 HR WT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.008 | 0.812 | 3.543 | 1.921 | 1.589 |
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.348 | 0.540 | 1.176 | 0.176 | 0.201 |
| 2 | ABS | RT | 3 | 3 | 3 | 3 | CREME/WHITE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 2 | ABS | 60 | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 3 | ACETAL | RT | 0 | 0 | 0 | 0 | NONE | 0.539 | 0.962 | 0.047 | 1.360 | 0.960 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | 1.896 | 1.779 | 0.000 | 4.684 | 4.535 |
| 4 | PHENOLIC | RT | 0 | 0 | 0 | 0 | NONE | 0.171 | 0.943 | 3.587 | 1.426 | 1.302 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | 0.043 | 0.268 | −1.142 | 0.523 | 0.465 |
| 5 | POLYVINYLIDENE FLUORIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.056 | −0.130 | 2.013 | 0.272 | 0.392 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | 1.404 | 1.357 | 2.381 | 3.779 | 3.568 |
| 6 | POLYCARBONATE | RT | 0 | 0 | 0 | 0 | NONE | −0.014 | −0.664 | 1.944 | 0.799 | 0.677 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | CLEAR/CLOUDY | 0.085 | 1.604 | 3.066 | 5.867 | 5.552 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.673 | 4.378 | 0.695 | 0.514 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 0 | 0 | 0 | 0 | GRAY/WHITE STREAKS | 0.014 | 1.072 | 3.125 | 5.936 | 5.390 |
| 8 | POLYPROPYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.545 | 1.360 | 2.778 | 1.492 | 1.296 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | LUCITE/CLOUDY | 1.446 | 0.841 | 2.756 | 7.594 | 6.363 |
| 9 | POLYARYL SULFONE | RT | 0 | 0 | 0 | 0 | NONE | 0.142 | 0.804 | 2.375 | 0.999 | 0.720 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.057 | 0.134 | −2.281 | 0.240 | −0.043 |
| 10 | POLYETHYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | LT. TAN/WHITE EDGES | −0.043 | 0.674 | 1.984 | 0.675 | 0.616 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | TAN/LIGHTER EDGES | −0.014 | 0.134 | −0.388 | 1.013 | 0.983 |
| 11 | POLYPHENYLENE SULFIDE | RT | 0 | 0 | 0 | 0 | NONE | −0.057 | 0.268 | 0.794 | 0.124 | 0.234 |
| 11 | POLYPHENYLENE SULFIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.014 | 0.134 | −2.643 | 1.265 | 0.046 |
| 12 | POLYTETRAFLUOROETHYLENE | RT | 0 | 0 | 0 | 0 | NONE | 1.522 | 2.491 | 2.267 | 4.432 | 3.176 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 1.743 | 1.942 | −2.423 | 5.469 | 3.715 |
| 13 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.178 | 0.942 | 2.729 | 1.172 | 1.112 |
| 13 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.000 | −0.133 | −1.504 | −0.130 | −0.123 |
| 14 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.029 | 0.537 | 0.394 | 0.841 | 0.852 |
| 14 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.000 | −0.382 | 0.003 | 0.026 |
| 15 | POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.242 | 0.671 | −1.527 | 0.584 | 0.561 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.043 | 0.000 | 0.775 | 0.250 | 0.127 |
| 16 | MODIFIED POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.209 | 0.645 | 2.062 | 0.584 | 0.532 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.062 | 0.322 | 0.004 | 0.110 | 0.038 |
| 17 | POLYARYLETHERKETONE | RT | 0 | 0 | 0 | 0 | NONE | 1.637 | 0.272 | 2.368 | 0.313 | 0.334 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.078 | 0.136 | −0.385 | −0.046 | −0.053 |
| 18 | POLYBUTYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.043 | 0.544 | 1.178 | 2.162 | 2.198 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.130 | 0.405 | 1.935 | 1.902 | 1.885 |
| 19 | POLYIMIDE-DF | RT | 0 | 0 | 0 | 0 | NONE | 0.160 | 0.000 | 7.921 | 1.535 | 1.238 |
| 19 | POLYIMIDE-DF | 60 | 0 | 0 | 0 | 0 | NONE | 0.029 | 0.000 | −4.571 | 0.213 | 0.116 |
| 20 | POLYIMIDE-DF-ISO | RT | 0 | 0 | 0 | 0 | NONE | 0.044 | 0.152 | 4.036 | 0.704 | 0.742 |
| 20 | POLYIMIDE-DF-ISO | 60 | 0 | 0 | 0 | 0 | NONE | 0.029 | 0.151 | −4.080 | 0.020 | −0.024 |
| 21 | POLY(ARYLETHERETHERKETONE) | RT | 0 | 0 | 0 | 0 | NONE | −0.086 | 0.813 | 1.969 | 0.238 | 0.279 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | −0.014 | 0.000 | 0.000 | 0.059 | 0.045 |
| 22 | LIQUID CRYSTAL POLYMER | RT | 0 | 0 | 0 | 0 | NONE | −0.014 | 0.404 | 1.994 | 0.050 | 0.163 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | 0.028 | −0.268 | −0.775 | −0.295 | 0.072 |
| 23 | 66 NYLON, POLYAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.475 | 1.359 | 3.165 | 3.460 | 2.679 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.072 | 0.407 | −1.539 | 0.239 | 0.280 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, RT = ambient
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN HFC-125 (R-125)

TABLE C-5

| NO | TYPE | TEMPERATURE Deg. C a | PARTICULATES b | CRACKING b | CRAZING b | SOFTENING b | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c | AVERAGE% WIDTH CHANGE c | AVERAGE% THICKNESS CHANGE c | AVERAGE% WEIGHT CHANGE c | AVERAGE% 24 HR. WT. CHANGE c |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.167 | 0.269 | -0.769 | 0.587 | 0.537 |
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | CREAM/OFF WHITE | -0.250 | 1.082 | 0.781 | 1.113 | 1.057 |
| 2 | ABS | RT | 0 | 0 | 0 | 0 | NONE | 0.271 | -0.133 | -0.388 | 0.659 | 0.380 |
| 2 | ABS | 60 | 0 | 0 | 0 | 0 | NONE | 0.100 | 0.400 | 1.559 | 1.300 | 1.115 |
| 3 | ACETAL | RT | 0 | 0 | 0 | 0 | NONE | 0.496 | 0.409 | -2.296 | 1.145 | 0.648 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | 0.831 | 0.822 | -1.914 | 2.058 | 1.656 |
| 4 | PHENOLIC | RT | 0 | 0 | 0 | 0 | NONE | 0.171 | 0.000 | -7.606 | 0.921 | 0.854 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | 0.228 | 0.538 | 0.769 | 1.357 | 1.417 |
| 5 | POLYVINYLIDENE FLUORIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.094 | -0.270 | -1.536 | 0.341 | 0.242 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.707 | 0.949 | 0.403 | 1.725 | 1.639 |
| 6 | POLYCARBONATE | RT | 0 | 0 | 0 | 0 | NONE | -0.692 | -0.926 | -1.116 | 0.360 | 0.220 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.023 | 0.268 | -0.382 | 0.624 | 0.470 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.215 | -0.268 | 0.003 | 0.301 | 0.132 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.043 | 0.134 | 0.000 | 0.485 | 0.368 |
| 8 | POLYPROPYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.218 | -0.267 | -2.256 | 0.355 | 0.361 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | LUCITE/CLOUDY | 0.595 | 0.272 | 0.391 | 2.381 | 2.223 |
| 9 | POLYARYL SULFONE | RT | 0 | 0 | 0 | 0 | NONE | 0.014 | -0.133 | 0.394 | 0.285 | 0.218 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.100 | 0.000 | 0.391 | -0.100 | -0.005 |
| 10 | POLYETHYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.213 | -0.267 | -1.157 | 0.430 | 0.301 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.043 | 0.134 | 0.009 | 0.993 | 0.878 |
| 11 | POLYPHENYLENESULFIDE | RT | 0 | 0 | 0 | 0 | NONE | 1.559 | 0.268 | -0.751 | 0.173 | 0.091 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.042 | 0.268 | 0.394 | 0.240 | 0.221 |
| 12 | POLYTETRAFLUOROETHYLENE | RT | 0 | 0 | 0 | 0 | NONE | 1.383 | -0.589 | 0.807 | 4.149 | 2.645 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 2.027 | 1.979 | -0.373 | 3.734 | 2.760 |
| 13 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.023 | 0.401 | -1.148 | 1.348 | 1.256 |
| 13 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.157 | 0.535 | 1.550 | -0.060 | 0.014 |
| 14 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.171 | 0.133 | 0.772 | 1.028 | 0.943 |
| 14 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.029 | 0.000 | 0.003 | 0.029 | 0.079 |
| 15 | POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.071 | -0.266 | -3.030 | 0.733 | 0.681 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.100 | 0.402 | -2.202 | 0.751 | 0.613 |
| 16 | MODIFIED POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.167 | -0.053 | -0.308 | 0.789 | 0.642 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.071 | 0.000 | -0.459 | 0.725 | 0.606 |
| 17 | POLYARYLETHERKETONE | RT | 0 | 0 | 0 | 0 | NONE | -0.255 | 0.135 | 0.394 | 0.356 | 0.282 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.056 | 0.000 | -1.527 | -0.129 | -0.145 |
| 18 | POLYBUTYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.115 | 0.676 | -1.157 | 0.272 | 0.256 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.115 | 0.406 | 0.000 | 1.015 | 0.963 |
| 19 | POLYIMIDE-DF | RT | 0 | 0 | 0 | 0 | NONE | 0.305 | 1.813 | -3.267 | 0.162 | -0.199 |
| 19 | POLYIMIDE-DF | 60 | 0 | 0 | 0 | 0 | NONE | 0.305 | 0.447 | -3.670 | 1.403 | 1.157 |
| 20 | POLYIMIDE-DF-ISO | RT | 0 | 0 | 0 | 0 | NONE | 0.206 | -1.190 | -0.485 | 0.635 | 0.711 |
| 20 | POLYIMIDE-DF-ISO | 60 | 0 | 0 | 0 | 0 | NONE | 0.250 | 0.000 | -2.791 | 0.933 | 0.833 |
| 21 | POLY(ARYLETHERETHERKETONE) | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.135 | 0.394 | 0.242 | 0.180 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | -0.129 | 0.134 | -1.151 | -0.146 | -0.149 |
| 22 | LIQUID CRYSTAL POLYMER | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | -0.134 | -0.769 | 0.068 | 0.042 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | 0.057 | 0.402 | -0.388 | 0.085 | 0.067 |
| 23 | 66 NYLON, POLYAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.086 | 0.407 | 0.391 | 1.093 | 1.012 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.259 | 0.680 | 0.000 | 1.223 | 1.132 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, RT = ambient
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN HFC-134 (R-134)

**TABLE C-6**

| NO. | TYPE | TEMPERATURE Deg. C. a | PARTICULATES b | CRACKING b | CRAZING b | SOFTENING b | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. | AVERAGE% 24 HR WT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.043 | 0.677 | -0.769 | 1.926 | 1.490 |
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.202 | 0.000 | -0.778 | 0.024 | 0.060 |
| 2 | ABS | RT | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 2 | ABS | 60 | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 3 | ACETAL | RT | 0 | 0 | 0 | 0 | NONE | 1.764 | 1.646 | 0.394 | 3.370 | 2.355 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | 2.071 | 2.329 | 0.406 | 6.503 | 4.731 |
| 4 | PHENOLIC | RT | 0 | 0 | 0 | 0 | NONE | 0.242 | 0.808 | -1.530 | 1.776 | 1.371 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | -0.114 | 0.000 | 0.000 | -0.301 | -0.305 |
| 5 | POLYVINYLIDENE FLUORIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.100 | 0.545 | -1.184 | 0.599 | 0.568 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | 2.745 | 2.849 | 1.581 | 7.772 | 6.206 |
| 6 | POLYCARBONATE | RT | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.401 | 1.936 | 1.287 | 0.895 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | CLEAR/CLOUDY | -0.028 | 1.203 | 4.116 | 6.328 | 6.055 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.172 | 0.268 | 0.781 | 0.581 | 0.368 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.029 | 0.134 | -0.388 | 2.045 | 1.766 |
| 8 | POLYPROPYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.091 | -0.269 | -1.548 | 0.473 | 0.335 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | LUCITE/CLOUDY | 0.605 | 0.543 | -3.031 | 2.990 | 2.739 |
| 9 | POLYARYL SULFONE | RT | 0 | 0 | 0 | 0 | NONE | 0.199 | 0.402 | -2.256 | 1.117 | 0.729 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.114 | 0.000 | 0.000 | 0.243 | 0.244 |
| 10 | POLYETHYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | LT TAN/WHITE EDGES | 0.099 | 0.673 | -3.369 | 1.301 | 1.071 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | LT TAN/WHITE EDGES | 0.099 | 0.402 | 0.391 | 2.292 | 2.170 |
| 11 | POLYPHENYLENESULFIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.401 | 1.932 | 0.069 | 0.073 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.042 | 0.401 | -1.154 | 0.086 | 0.067 |
| 12 | POLYTETRAFLUOROETHYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.783 | 1.263 | -2.980 | 1.607 | 1.259 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 1.104 | -0.830 | -2.787 | 2.983 | 2.428 |
| 13 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.152 | 0.804 | -2.276 | 1.136 | 0.934 |
| 13 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.000 | -0.391 | -0.081 | 0.012 |
| 14 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.085 | 0.402 | -1.136 | 0.879 | 0.710 |
| 14 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.128 | 0.000 | 1.154 | 0.060 | 0.117 |
| 15 | POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.100 | 0.804 | -1.929 | 0.694 | 0.489 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.043 | 0.134 | 0.787 | 0.062 | 0.098 |
| 16 | MODIFIED POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.114 | 0.646 | -0.779 | 0.253 | 0.049 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.036 | 0.268 | 0.314 | 0.024 | 0.044 |
| 17 | POLYARYLETHERKETONE | RT | 0 | 0 | 0 | 0 | NONE | 0.030 | 0.813 | 0.000 | 0.315 | 0.236 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | -0.044 | 0.000 | -1.527 | -0.138 | -0.125 |
| 18 | POLYBUTYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.259 | 0.542 | -0.769 | 0.945 | 0.686 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.389 | 0.946 | 1.160 | 2.810 | 2.789 |
| 19 | POLYIMIDE-DF | RT | 0 | 0 | 0 | 0 | NONE | 0.334 | 0.902 | -0.948 | 1.623 | 1.170 |
| 19 | POLYIMIDE-DF | 60 | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.000 | 0.485 | 0.307 | 0.246 |
| 20 | POLYIMIDE-DF-ISO | RT | 0 | 0 | 0 | 0 | NONE | 0.132 | 0.152 | -1.896 | 0.694 | 0.525 |
| 20 | POLYIMIDE-DF-ISO | 60 | 0 | 0 | 0 | 0 | NONE | -0.103 | 0.000 | 0.000 | -0.321 | -0.305 |
| 21 | POLY(ARYLETHERETHERKETONE) | RT | 0 | 0 | 0 | 0 | NONE | -0.057 | 0.270 | -2.256 | 0.242 | 0.162 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | -0.501 | -0.673 | 2.362 | -0.046 | -0.037 |
| 22 | LIQUID CRYSTAL POLYMER | RT | 0 | 0 | 0 | 0 | NONE | 0.057 | 0.269 | 1.953 | 0.020 | 0.011 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.268 | -1.166 | 0.016 | 0.015 |
| 23 | 66 NYLON, POLYAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.461 | 1.493 | 1.172 | 3.408 | 2.601 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.029 | -0.405 | -1.157 | 0.381 | 0.459 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, RT = ambient
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN HFC–134a (R–134a)

TABLE C–7

| NO | TYPE | TEMPERATURE Deg. C a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. | AVERAGE% 24 HR. WT. CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.129 | 2.902 | 2.950 | 1.383 | 1.185 |
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.230 | −0.270 | 0.794 | −0.339 | −0.300 |
| 2 | ABS | RT | 0 | 0 | 0 | 0 | NONE | 0.157 | 1.743 | 1.569 | 1.774 | 1.194 |
| 2 | ABS | 60 | 0 | 0 | 0 | 0 | NONE | −0.199 | 2.271 | 3.107 | 9.463 | 8.829 |
| 3 | ACETAL | RT | 0 | 0 | 0 | 0 | NONE | 0.378 | 2.092 | 5.833 | 1.377 | 0.781 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | 1.441 | 1.366 | −2.296 | 3.527 | 2.716 |
| 4 | PHENOLIC | RT | 0 | 0 | 0 | 0 | NONE | 0.441 | 0.673 | 5.039 | 1.893 | 1.419 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | 0.242 | 0.267 | −3.344 | 0.730 | 1.339 |
| 5 | POLYVINYLIDENE FLUORIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.263 | 0.956 | 0.806 | 0.728 | 0.539 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | 2.300 | 2.301 | 3.200 | 0.860 | 0.145 |
| 6 | POLYCARBONATE | RT | 0 | 0 | 0 | 0 | NONE | 1.226 | 3.017 | 3.587 | 0.554 | 0.299 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.299 | 0.000 | 0.000 | 1.409 | 1.196 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.057 | 0.404 | 1.181 | 0.324 | 0.175 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.100 | 0.535 | −1.136 | 1.208 | 1.003 |
| 8 | POLYPROPYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.168 | 0.822 | −0.781 | 0.530 | 0.373 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | LUCITE/CLOUDY | 0.951 | 0.407 | 0.797 | 2.870 | 2.529 |
| 9 | POLYARYL SULFONE | RT | 0 | 0 | 0 | 0 | NONE | 0.485 | 2.743 | 6.148 | 0.752 | 0.479 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.043 | −0.266 | 0.787 | −0.126 | −0.064 |
| 10 | POLYETHYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.198 | 2.339 | 2.866 | 0.401 | 0.245 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.057 | 0.001 | 0.787 | 0.505 | 0.518 |
| 11 | POLYPHENYLENESULFIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.405 | 0.000 | 0.096 | 0.042 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | CHOCOLATE/LIGHTER | 0.042 | 0.134 | −3.759 | 0.473 | 0.416 |
| 12 | POLYTETRAFLUOROETHYLENE | RT | 0 | 0 | 0 | 0 | NONE | 1.329 | −0.103 | 9.619 | 2.305 | 1.875 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 1.504 | 1.151 | 1.910 | 2.982 | 2.231 |
| 13 | POLYAMIDE–IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.136 | 0.943 | 0.754 | 1.152 | 0.951 |
| 13 | POLYAMIDE–IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.157 | 0.134 | −2.273 | 1.082 | 1.067 |
| 14 | POLYAMIDE–IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.071 | 0.673 | 1.160 | 0.870 | 0.685 |
| 14 | POLYAMIDE–IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.114 | 0.133 | −0.376 | 1.012 | 1.000 |
| 15 | POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.584 | 0.673 | 0.394 | 0.776 | 0.412 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.142 | 0.267 | 0.787 | 1.069 | 0.919 |
| 16 | MODIFIED POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.096 | 0.700 | 0.957 | 0.656 | 0.446 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.003 | 0.054 | −0.292 | 0.776 | 0.660 |
| 17 | POLYARYLETHERKETONE | RT | 0 | 0 | 0 | 0 | NONE | 0.136 | 2.072 | 5.417 | 0.395 | 0.243 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.227 | 0.925 | −1.880 | 0.384 | 0.337 |
| 18 | POLYBUTYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.274 | 0.407 | 0.391 | 0.308 | 0.180 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.245 | 0.270 | 1.563 | 1.603 | 1.530 |
| 19 | POLYIMIDE–DF | RT | 0 | 0 | 0 | 0 | NONE | 0.524 | 2.439 | 6.701 | 1.513 | 1.065 |
| 19 | POLYIMIDE–DF | 60 | 0 | 0 | 0 | 0 | NONE | 0.131 | 0.149 | −0.971 | 0.794 | 0.693 |
| 20 | POLYIMIDE–DF–ISO | RT | 0 | 0 | 0 | 0 | NONE | 0.339 | 2.477 | 6.186 | 0.745 | 0.553 |
| 20 | POLYIMIDE–DF–ISO | 60 | 0 | 0 | 0 | 0 | NONE | 0.088 | −0.151 | −0.485 | 0.418 | 0.394 |
| 21 | POLY(ARYLETHERETHERKETONE) | RT | 0 | 0 | 0 | 0 | NONE | 0.244 | 1.928 | 7.058 | 0.364 | 0.186 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | 0.186 | 0.000 | 1.148 | 0.277 | 0.232 |
| 22 | LIQUID CRYSTAL POLYMER | RT | 0 | 0 | 0 | 0 | NONE | 0.042 | 0.675 | 1.587 | 0.035 | 0.026 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | 0.071 | −0.535 | −2.317 | 0.264 | 0.233 |
| 23 | 66 NYLON, POLYAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.591 | 3.186 | 3.690 | 2.691 | 2.210 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.101 | 0.271 | −1.133 | 0.512 | 0.577 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, RT = ambient
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN HCFC-142b (R-142b)

TABLE C-8

| NO. | TYPE | TEMPERATURE Deg. C. a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. | AVERAGE% 24 HR WT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.271 | 1.563 | 0.225 | 0.192 |
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.426 | 0.404 | 0.000 | -0.019 | -0.001 |
| 2 | ABS | RT | 2 | 0 | 0 | 2 | CREAM/OFF WHITE | 0.000 | 2.410 | 4.267 | 13.249 | 10.998 |
| 2 | ABS | 60 | 2 | 0 | 0 | 1 | NONE | -5.126 | 8.968 | 21.484 | 29.868 | 26.306 |
| 3 | ACETAL | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.412 | -0.722 | 0.474 | 0.383 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | 1.311 | 1.651 | 0.812 | 2.668 | 2.369 |
| 4 | PHENOLIC | RT | 1 | 0 | 0 | 0 | NONE | 0.114 | 0.137 | -1.550 | 0.268 | 0.247 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | 0.043 | 0.270 | 0.402 | 0.370 | 0.284 |
| 5 | POLYVINYLIDENE FLUORIDE | RT | 0 | 0 | 0 | 0 | NONE | -0.058 | -0.270 | -0.766 | 0.407 | 0.367 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | 1.663 | 1.497 | 2.381 | 3.532 | 3.151 |
| 6 | POLYCARBONATE | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | -0.652 | -1.103 | 0.984 | 0.718 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.128 | 2.136 | 3.818 | 5.590 | 5.276 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.940 | 2.719 | 2.944 | 1.914 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 1 | 0 | 0 | 1 | NONE | -0.400 | 2.544 | 10.981 | 18.661 | 15.859 |
| 8 | POLYPROPYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.924 | 1.496 | -0.388 | 3.947 | 3.050 |
| 8 | POLYPROPYLENE | 60 | 1 | 0 | 0 | 0 | NONE | 1.990 | 2.307 | 1.181 | 8.829 | 5.103 |
| 9 | POLYARYL SULFONE | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | -0.263 | -0.769 | 0.063 | 0.149 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.028 | 0.536 | -4.119 | 0.000 | 0.015 |
| 10 | POLYETHYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.403 | -1.489 | 0.295 | 0.269 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 1 | 0 | 0 | 0 | NONE | -0.128 | 0.268 | 1.181 | 0.743 | 0.722 |
| 11 | POLYPHENYLENESULFIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.134 | 0.775 | 0.135 | 0.141 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.028 | 0.134 | -1.862 | 0.026 | 0.015 |
| 12 | POLYTETRAFLUOROETHYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.945 | 0.003 | 0.360 | 2.138 | 1.787 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 1.568 | 1.248 | 0.803 | 3.015 | 1.988 |
| 13 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | -0.021 | 0.805 | 0.376 | 0.149 | 0.204 |
| 13 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.035 | -0.134 | -1.493 | -0.061 | 0.031 |
| 14 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.268 | -0.373 | 0.150 | 0.202 |
| 14 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.043 | 0.133 | 0.385 | 0.024 | 0.085 |
| 15 | POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | -0.264 | 2.347 | 0.119 | 0.147 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.000 | 0.000 | -0.007 | 0.025 |
| 16 | MODIFIED POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.268 | 0.004 | 0.129 | 0.124 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.003 | 0.267 | 0.471 | 0.045 | 0.039 |
| 17 | POLYARYLETHERKETONE | RT | 1 | 0 | 0 | 0 | NONE | 0.029 | 0.008 | -3.393 | 0.151 | 0.129 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.271 | -0.746 | -0.073 | -0.048 |
| 18 | POLYBUTYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.136 | -0.388 | 0.252 | 0.231 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.144 | 0.677 | 2.747 | 1.246 | 1.242 |
| 19 | POLYIMIDE-DF | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.000 | 0.014 | 0.229 | 0.217 |
| 19 | POLYIMIDE-DF | 60 | 0 | 0 | 0 | 0 | NONE | 0.015 | 0.298 | 0.971 | 0.023 | 0.351 |
| 20 | POLYIMIDE-DF-ISO | RT | 0 | 0 | 0 | 0 | NONE | -0.015 | 0.152 | -5.951 | 0.160 | 0.160 |
| 20 | POLYIMIDE-DF-ISO | 60 | 0 | 0 | 0 | 0 | NONE | 0.044 | 0.000 | 0.980 | -0.098 | -0.078 |
| 21 | POLY(ARYLETHERETHERKETONE) | RT | 1 | 0 | 0 | 0 | NONE | -0.029 | -0.135 | -0.778 | 0.138 | 0.129 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | 0.043 | -0.269 | -2.632 | -0.003 | 0.002 |
| 22 | LIQUID CRYSTAL POLYMER | RT | 0 | 0 | 0 | 0 | NONE | 0.000 | 0.403 | -1.544 | 0.142 | 0.145 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | 0.028 | 0.134 | 0.787 | -0.006 | -0.008 |
| 23 | 66 NYLON, POLYAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.072 | 0.407 | -0.775 | 0.132 | 0.163 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | -0.058 | 0.271 | -4.150 | 0.063 | 0.120 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, RT = ambient
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN HFC-143a (R-143a)

**TABLE C-9**

| NO. | TYPE | TEMPERATURE Deg. C a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. | AVERAGE% 24 HR WT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | RT | 0 | 0 | 0 | 0 | NONE | -0.094 | 0.134 | 3.175 | 1.761 | 1.393 |
| 1 | POLYPHTHALAMIDE | 60 | 0 | 0 | 0 | 0 | YELLOW/OFF WHITE | -0.229 | 0.000 | 0.394 | 1.498 | 1.487 |
| 2 | ABS | RT | 0 | 0 | 0 | 0 | NONE | 0.085 | 0.402 | 0.775 | 0.750 | 0.461 |
| 2 | ABS | 60 | 0 | 0 | 0 | 0 | CREAM/OFF WHITE | 0.256 | 0.266 | 1.944 | 2.940 | 2.684 |
| 3 | ACETAL | RT | 0 | 0 | 0 | 0 | NONE | -0.215 | 0.137 | 1.997 | 0.690 | 0.428 |
| 3 | ACETAL | 60 | 0 | 0 | 0 | 0 | NONE | 1.125 | 0.548 | 0.787 | 1.815 | 1.487 |
| 4 | PHENOLIC | RT | 0 | 0 | 0 | 0 | NONE | 0.142 | 0.268 | 1.128 | 1.264 | 1.075 |
| 4 | PHENOLIC | 60 | 0 | 0 | 0 | 0 | NONE | 0.085 | 0.000 | 0.388 | 0.288 | 0.282 |
| 5 | POLYVINYLIDENE FLUORIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.203 | 0.136 | 0.000 | 0.378 | 0.324 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 0 | 0 | 0 | 0 | NONE | 1.584 | 1.355 | 1.190 | 3.180 | 2.961 |
| 6 | POLYCARBONATE | RT | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.268 | 1.932 | 0.395 | 0.295 |
| 6 | POLYCARBONATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.128 | 0.266 | 1.154 | 0.968 | 0.870 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.541 | -0.769 | 0.371 | 0.268 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.114 | 0.402 | 1.545 | 1.169 | 1.031 |
| 8 | POLYPROPYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.357 | 0.137 | 2.344 | 0.800 | 0.676 |
| 8 | POLYPROPYLENE | 60 | 0 | 0 | 0 | 0 | LUCITE/CLOUDY | 0.526 | -0.131 | -0.388 | 2.835 | 2.513 |
| 9 | POLYARYL SULFONE | RT | 0 | 0 | 0 | 0 | NONE | 0.128 | -0.266 | -3.662 | 0.857 | 0.706 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.895 | 0.134 | 0.009 | 0.722 | 0.623 |
| 10 | POLYETHYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | -0.028 | -0.531 | 2.344 | 0.325 | 0.241 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.057 | 0.403 | -0.760 | 0.937 | 0.884 |
| 11 | POLYPHENYLENESULFIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.028 | 0.268 | 0.012 | 0.081 | 0.083 |
| 11 | POLYPHENYLENESULFIDE | 60 | 0 | 0 | 0 | 0 | CHOCOLATE/LIGHTER | 0.014 | 0.000 | -1.151 | 8.412 | 0.218 |
| 12 | POLYTETRAFLUOROETHYLENE | RT | 0 | 0 | 0 | 0 | NONE | 1.429 | -1.318 | 4.262 | 2.553 | 1.906 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 0 | 0 | 0 | 0 | NONE | 1.003 | 1.447 | 2.327 | 2.044 | 1.654 |
| 13 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.148 | 0.802 | 0.405 | 1.084 | 0.975 |
| 13 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.127 | -0.134 | 0.003 | -10.880 | 0.579 |
| 14 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.014 | 0.002 | 0.772 | 0.758 | 0.667 |
| 14 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.100 | -0.401 | -0.376 | -6.505 | 0.635 |
| 15 | POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.071 | 0.000 | 2.323 | 0.285 | 0.216 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.071 | -0.267 | 0.000 | 0.478 | 0.433 |
| 16 | MODIFIED POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.555 | -0.049 | 0.013 | 0.605 | 0.452 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.123 | -0.160 | -0.900 | 0.267 | 0.248 |
| 17 | POLYARYLETHERKETONE | RT | 0 | 0 | 0 | 0 | NONE | 0.110 | -1.060 | 1.190 | 0.290 | 0.220 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.147 | 0.000 | -0.716 | 0.456 | 0.415 |
| 18 | POLYBUTYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.216 | 0.406 | -0.758 | 0.288 | 0.234 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 0 | 0 | 0 | 0 | NONE | 0.158 | 0.271 | 1.918 | 0.980 | 0.941 |
| 19 | POLYIMIDE-DF | RT | 0 | 0 | 0 | 0 | NONE | 0.290 | 0.447 | 0.490 | 1.369 | 1.021 |
| 19 | POLYIMIDE-DF | 60 | 0 | 0 | 0 | 0 | NONE | 0.276 | 0.298 | -4.545 | 0.954 | 0.834 |
| 20 | POLYIMIDE-DF-ISO | RT | 0 | 0 | 0 | 0 | NONE | 0.147 | 0.455 | 0.005 | 0.718 | 0.569 |
| 20 | POLYIMIDE-DF-ISO | 60 | 0 | 0 | 0 | 0 | NONE | 0.118 | 0.303 | 0.966 | 0.618 | 0.565 |
| 21 | POLY(ARYLETHERETHERKETONE) | RT | 0 | 0 | 0 | 0 | NONE | 0.172 | -0.801 | 1.600 | 0.139 | 0.088 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | 0.072 | -0.538 | 0.000 | 0.346 | 0.307 |
| 22 | LIQUID CRYSTAL POLYMER | RT | 0 | 0 | 0 | 0 | NONE | -0.071 | 0.403 | 0.778 | 0.026 | 0.029 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 0 | 0 | 0 | 0 | NONE | 0.127 | -0.402 | 0.778 | -16.450 | 0.079 |
| 23 | 66 NYLON, POLYAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.187 | -0.267 | -1.100 | 2.620 | 2.111 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.404 | 0.405 | -0.385 | 1.915 | 1.805 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, RT = ambient
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CHANGES IN PLASTICS IMMERSED IN HFC-152a (R-152a)

**TABLE C-10**

| NO. | TYPE | TEMPERATURE Deg. C. a. | PARTICULATES b. | CRACKING b. | CRAZING b. | SOFTENING b. | COLOR CHANGE | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. | AVERAGE% 24 HR WT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.211 | −0.775 | 1.965 | 1.644 | 1.287 |
| 1 | POLYPHTHALAMIDE | 60 | 1 | 0 | 0 | 0 | CREAM/OFF WHITE | −0.876 | −0.002 | 0.000 | −0.090 | −0.115 |
| 2 | ABS | RT | 1 | 0 | 0 | 2 | NONE | −5.140 | 0.000 | 147.704 | 19.111 | 14.809 |
| 2 | ABS | 60 | 0 | 0 | 0 | 0 | NONE | FAILED | FAILED | FAILED | FAILED | FAILED |
| 3 | ACETAL | RT | 0 | 0 | 0 | 0 | NONE | 1.327 | 1.235 | 2.390 | 3.573 | 2.903 |
| 3 | ACETAL | 60 | 2 | 0 | 0 | 0 | NONE | 1.327 | 1.094 | 0.791 | 3.817 | 2.645 |
| 4 | PHENOLIC | RT | 0 | 0 | 0 | 0 | NONE | 0.299 | 0.268 | −0.758 | 1.908 | 1.510 |
| 4 | PHENOLIC | 60 | 2 | 0 | 0 | 0 | NONE | −0.028 | 0.268 | 0.000 | 0.152 | 0.109 |
| 5 | POLYVINYLIDENE FLUORIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.826 | 0.948 | 1.994 | 2.021 | 1.614 |
| 5 | POLYVINYLIDENE FLUORIDE | 60 | 2 | 0 | 0 | 0 | NONE | 1.381 | 4.336 | 2.778 | 8.961 | 5.325 |
| 6 | POLYCARBONATE | RT | 1 | 0 | 0 | 0 | NONE | 0.057 | 0.401 | 2.713 | 2.473 | 1.799 |
| 6 | POLYCARBONATE | 60 | 1 | 0 | 0 | 1 | CLEAR/CLOUDY | −0.754 | 0.534 | 7.692 | 6.372 | 5.991 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.257 | 0.535 | 2.753 | 2.241 | 1.441 |
| 7 | MODIFIED POLYPHENYLENE OXIDE | 60 | 2 | 0 | 0 | 0 | NONE | 0.342 | 2.406 | 3.531 | 9.278 | 8.265 |
| 8 | POLYPROPYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.522 | 0.271 | −1.929 | 1.513 | 1.165 |
| 8 | POLYPROPYLENE | 60 | 3 | 0 | 0 | 0 | NONE | 0.693 | 1.355 | 0.787 | 4.888 | 3.214 |
| 9 | POLYARYL SULFONE | RT | 0 | 0 | 0 | 0 | NONE | 0.591 | 0.812 | 2.362 | 3.264 | 2.562 |
| 9 | POLYARYL SULFONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.028 | 0.000 | 0.778 | 0.780 | 0.640 |
| 10 | POLYETHYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | −0.014 | 0.537 | −0.373 | 0.842 | 0.579 |
| 10 | POLYETHYLENE TEREPHTHALATE | 60 | 3 | 0 | 0 | 0 | NONE | 0.099 | 0.669 | 1.581 | 2.272 | 2.127 |
| 11 | POLYPHENYLENE SULFIDE | RT | 0 | 0 | 0 | 0 | NONE | 1.471 | 0.000 | 1.181 | 0.137 | 0.088 |
| 11 | POLYPHENYLENE SULFIDE | 60 | 2 | 0 | 0 | 0 | CHOCOLATE/LT. BROWN | −0.099 | −0.533 | 0.000 | 0.064 | 0.073 |
| 12 | POLYTETRAFLUOROETHYLENE | RT | 0 | 0 | 0 | 0 | NONE | 0.702 | 0.304 | 3.712 | 1.129 | 0.891 |
| 12 | POLYTETRAFLUOROETHYLENE | 60 | 1 | 0 | 0 | 0 | NONE | 0.682 | 0.317 | −0.012 | 1.964 | 1.394 |
| 13 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.093 | 0.000 | −0.003 | 0.310 | 0.326 |
| 13 | POLYAMIDE-IMIDE | 60 | 1 | 0 | 0 | 0 | NONE | 0.000 | −0.662 | 0.003 | −0.150 | −0.104 |
| 14 | POLYAMIDE-IMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.611 | 0.267 | −0.385 | 0.251 | 0.250 |
| 14 | POLYAMIDE-IMIDE | 60 | 0 | 0 | 0 | 0 | NONE | 0.128 | 0.134 | 0.003 | 0.041 | 0.061 |
| 15 | POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.171 | 1.374 | −0.385 | 0.853 | 0.601 |
| 15 | POLYETHERIMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.028 | −0.266 | 2.344 | 0.409 | 0.319 |
| 16 | MODIFIED POLYETHERIMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.108 | 0.413 | 0.198 | 0.831 | 0.651 |
| 16 | MODIFIED POLYETHERIMIDE | 60 | 1 | 0 | 0 | 0 | NONE | 0.008 | 0.381 | 0.939 | 0.578 | 0.472 |
| 17 | POLYARYLETHERKETONE | RT | 0 | 0 | 0 | 0 | NONE | −0.007 | 0.000 | 0.800 | −0.543 | −0.579 |
| 17 | POLYARYLETHERKETONE | 60 | 0 | 0 | 0 | 0 | NONE | 0.062 | 0.000 | 3.159 | −0.080 | −0.076 |
| 18 | POLYBUTYLENE TEREPHTHALATE | RT | 0 | 0 | 0 | 0 | NONE | 0.216 | 0.135 | 0.000 | 0.701 | 0.508 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 60 | 2 | 0 | 0 | 0 | NONE | 0.792 | 0.809 | 1.166 | 3.238 | 3.107 |
| 19 | POLYIMIDE-DF | RT | 0 | 0 | 0 | 0 | NONE | 0.421 | 0.447 | 2.956 | 2.019 | 1.569 |
| 19 | POLYIMIDE-DF | 60 | 0 | 0 | 0 | 0 | NONE | 0.087 | 0.149 | 0.481 | 0.885 | 0.700 |
| 20 | POLYIMIDE-DF-ISO | RT | 0 | 0 | 0 | 0 | NONE | 0.147 | 0.303 | 1.980 | 0.770 | 0.622 |
| 20 | POLYIMIDE-DF-ISO | 60 | 1 | 0 | 0 | 0 | NONE | 0.000 | −0.151 | 0.500 | −0.221 | −0.228 |
| 21 | POLY(ARYLETHERETHERKETONE) | RT | 0 | 0 | 0 | 0 | NONE | 0.043 | 0.135 | 1.187 | 0.055 | 0.011 |
| 21 | POLY(ARYLETHERETHERKETONE) | 60 | 0 | 0 | 0 | 0 | NONE | −0.014 | 0.270 | 1.956 | 0.046 | 0.064 |
| 22 | LIQUID CRYSTAL POLYMER | RT | 0 | 0 | 0 | 0 | NONE | 0.057 | 0.269 | −3.381 | −0.024 | −0.047 |
| 22 | LIQUID CRYSTAL POLYMER | 60 | 1 | 0 | 0 | 0 | NONE | 0.014 | 0.134 | 0.000 | 0.013 | 0.025 |
| 23 | 66 NYLON, POLYAMIDE | RT | 0 | 0 | 0 | 0 | NONE | 0.100 | 0.267 | 2.359 | 1.217 | 0.823 |
| 23 | 66 NYLON, POLYAMIDE | 60 | 0 | 0 | 0 | 0 | NONE | −0.043 | 0.270 | 1.181 | 0.213 | 0.222 |

Note:
a. Temperature conversions: 60 deg.C = 140 deg.F, RT = ambient
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## CREEP OF ENGINEERING PLASTICS IN SYNTHETIC LUBRICANT / REFRIGERANT ENVIRONMENT

**[14 DAY CREEP AT 20 DEG. C. (68 DEG. F.) IN 32 ISO VG BRANCHED ACID, POLYOL ESTER WITH 40% HCFC-22 (R-22) BY WEIGHT]**

**TABLE D-1**

| NO. | TYPE | HCFC-22 (R-22) equilibrium test pressure = 97 psi<br>Creep Modulus<br>time (hours) | | | | | | | | | | time of break or start of yielding |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10 | | 50 | | 100 | | 200 | | 300 | | |
| | | ksi | kg/mm^2 | ksi | kg/mm^2 | ksi | kg/mm^2 | ksi | kg/mm^2 | ksi | kg/mm^2 | |
| 1 | POLYPHTHALAMIDE | 957.4 | 673.3 | 718.0 | 505.0 | 675.8 | 475.3 | 574.4 | 404.0 | 522.2 | 367.3 | |
| 2 | ACRYLONITRILE-BUTADIENE-STYRENE TERPOLYMER | – | – | – | – | – | – | – | – | – | – | broke @ 1 hr |
| 3 | ACETAL | 487.7 | 343.0 | 304.8 | 214.4 | 143.4 | 100.9 | 42.4 | 29.8 | 34.8 | 24.5 | yield @ 150 hr |
| 4 | PHENOLIC | 3075.6 | 2160.7 | 2870.6 | 2016.7 | 2691.2 | 1890.6 | 2691.2 | 1890.6 | 2152.9 | 1512.5 | |
| 5 | POLYVINYLIDENE FLUORIDE | 617.7 | 434.2 | 336.9 | 236.8 | 185.3 | 130.3 | 148.2 | 104.2 | 123.5 | 86.8 | |
| 6 | POLYCARBONATE | 2547.1 | 1790.0 | 1273.5 | 895.0 | 849.0 | 596.7 | 509.4 | 358.0 | 424.5 | 298.3 | |
| 7 | MODIFIED POLYPHENYLENE OXIDE | – | – | – | – | – | – | – | – | – | – | broke @ 1 hr |
| 8 | POLYPROPYLENE | 359.8 | 252.7 | 134.9 | 94.8 | 90.0 | 63.2 | 54.0 | 37.9 | 28.7 | 20.2 | yield @ 200 hr |
| 9 | POLYARYL SULFONE | 4242.7 | 2983.3 | 2447.7 | 1721.2 | 1591.0 | 1118.8 | 1060.7 | 745.8 | 795.5 | 559.4 | |
| 10 | POLYETHYLENE TEREPHTHALATE | 2068.9 | 1455.0 | 1724.1 | 1212.5 | 1477.8 | 1039.3 | 1124.4 | 790.8 | 1100.5 | 773.9 | |
| 11 | POLYPHENYLENESULFIDE | 7087.2 | 4983.3 | 5315.4 | 3737.5 | 4252.3 | 2990.0 | 4252.3 | 2990.0 | 4252.3 | 2990.0 | |
| 13 | POLYAMIDE-IMIDE | 3034.8 | 2133.7 | 2792.0 | 1963.0 | 2326.7 | 1635.8 | 1745.0 | 1226.9 | 1396.0 | 981.5 | |
| 14 | POLYAMIDE-IMIDE | 2873.8 | 2020.0 | 2498.9 | 1756.5 | 2299.0 | 1616.0 | 1642.1 | 1154.3 | 1277.2 | 897.8 | |
| 15 | POLYETHERIMIDE | 4921.9 | 3459.4 | 2316.2 | 1627.9 | 1575.0 | 1107.0 | 1193.2 | 838.6 | 960.4 | 675.0 | |
| 16 | MODIFEID POLYETHERIMIDE | 603.8 | 424.6 | 381.3 | 268.2 | 326.4 | 229.5 | 326.4 | 229.5 | 322.0 | 226.4 | |
| 17 | POLYARYLETHERKETONE | 4670.5 | 3284.4 | 3736.4 | 2627.5 | 3736.4 | 2627.5 | 2335.3 | 1642.2 | 2075.8 | 1459.7 | |
| 18 | POLYBUTYLENE TEREPHTHALATE | 1453.9 | 1022.0 | 363.5 | 255.5 | 290.8 | 204.4 | 207.7 | 146.0 | 165.2 | 116.1 | |
| 19 | POLYIMIDE-DF | 2716.2 | 1910.0 | 1086.5 | 764.0 | 679.0 | 477.5 | 543.2 | 382.0 | 452.7 | 318.3 | |
| 20 | POLYIMIDE-DF-ISO | 3052.2 | 2145.0 | 1017.4 | 715.0 | 953.8 | 670.3 | 872.1 | 612.9 | 824.9 | 579.7 | |
| 21 | POLY(ARYLETHERETHERKETONE) | 2991.6 | 2104.2 | 1436.0 | 1010.0 | 1196.7 | 841.7 | 1025.7 | 721.4 | 897.5 | 631.3 | |
| 22 | LIQUID CRYSTAL POLYMER | 4135.6 | 2906.3 | 3308.5 | 2325.0 | 2363.2 | 1660.7 | 1654.2 | 1162.5 | 1203.1 | 845.5 | |
| 23 | 66 NYLON, POLYAMIDE | 491.4 | 345.5 | 245.7 | 172.8 | 196.6 | 138.2 | 169.4 | 119.1 | 163.8 | 115.2 | |

## CREEP OF ENGINEERING PLASTICS IN SYNTHETIC LUBRICANT / REFRIGERANT ENVIRONMENT

**[14 DAY CREEP AT 20 DEG. C. (68 DEG. F.) IN 32 ISO VG BRANCHED ACID, POLYOL ESTER WITH 40% HFC-152a (R-152a) BY WEIGHT]**

**TABLE D-2**

| NO. | TYPE | HFC-152a (R-152a) equilibrium test pressure = 55 psi<br>Creep Modulus<br>time (hours) | | | | | | | | | | time of break or start of yielding |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10 | | 50 | | 100 | | 200 | | 300 | | |
| | | ksi | kg/mm^2 | ksi | kg/mm^2 | ksi | kg/mm^2 | ksi | kg/mm^2 | ksi | kg/mm^2 | |
| 1 | POLYPHTHALAMIDE | 2051.6 | 1442.9 | 1795.1 | 1262.5 | 1689.5 | 1188.2 | 1305.5 | 918.2 | 1025.8 | 721.4 | |
| 2 | ACRYLONITRILE-BUTADIENE-STYRENE TERPOLYMER | – | – | – | – | – | – | – | – | – | – | broke @ 1 hr |
| 3 | ACETAL | 609.6 | 428.7 | 406.4 | 285.8 | 270.9 | 190.5 | 187.6 | 131.9 | 135.5 | 95.3 | |
| 4 | PHENOLIC | 10764.6 | 7570.8 | 7176.4 | 5047.2 | 4305.9 | 3028.3 | 3588.2 | 2523.6 | 2870.6 | 2018.9 | |
| 5 | POLYVINYLIDENE FLUORIDE | 264.7 | 186.2 | 154.4 | 108.6 | 123.5 | 86.9 | 100.2 | 70.4 | 82.4 | 57.9 | |
| 6 | POLYCARBONATE | 1273.5 | 895.7 | 849.0 | 597.1 | 749.1 | 526.9 | 636.8 | 447.8 | 599.3 | 421.5 | |
| 7 | MODIFIED POLYPHENYLENE OXIDE | – | – | – | – | – | – | – | – | – | – | broke @ 1 hr |
| 8 | POLYPROPYLENE | 269.9 | 189.8 | 112.4 | 79.1 | 96.4 | 67.8 | 84.3 | 59.3 | 75.0 | 52.7 | |
| 9 | POLYARYL SULFONE | 3182.1 | 2237.9 | 1272.8 | 895.2 | 1060.7 | 746.0 | 795.5 | 559.5 | 757.6 | 532.8 | |
| 10 | POLYETHYLENE TEREPHTHALATE | 5172.3 | 3637.7 | 3694.5 | 2598.3 | 3448.2 | 2425.1 | 2586.1 | 1818.8 | 2068.9 | 1455.1 | |
| 11 | POLYPHENYLENESULFIDE | 13288.6 | 9345.8 | 11812.1 | 8307.4 | 11812.1 | 8307.4 | 9664.4 | 6797.0 | 9491.8 | 6675.6 | |
| 13 | POLYAMIDE-IMIDE | 2326.7 | 1636.3 | 1623.2 | 1141.6 | 1485.1 | 1044.5 | 1269.1 | 892.5 | 1183.0 | 832.0 | |
| 14 | POLYAMIDE-IMIDE | 2873.8 | 2021.1 | 1553.4 | 1092.5 | 1306.3 | 918.7 | 1197.4 | 842.1 | 1149.5 | 808.4 | |
| 15 | POLYETHERIMIDE | 1575.0 | 1107.7 | 1230.5 | 865.4 | 1093.8 | 769.2 | 1036.2 | 728.7 | 984.4 | 692.3 | |
| 16 | MODIFEID POLYETHERIMIDE | 905.7 | 637.0 | 584.3 | 410.9 | 532.8 | 374.7 | 470.5 | 330.9 | 431.3 | 303.3 | |
| 17 | POLYARYLETHERKETONE | 4670.5 | 3284.8 | 3113.7 | 2189.8 | 2490.9 | 1751.9 | 2335.3 | 1642.4 | 2197.9 | 1545.8 | |
| 18 | POLYBUTYLENE TEREPHTHALATE | 727.0 | 511.3 | 466.0 | 327.7 | 370.9 | 260.8 | 370.9 | 260.8 | 363.5 | 255.6 | |
| 19 | POLYIMIDE-DF | 452.7 | 318.4 | 362.2 | 254.7 | 352.7 | 248.1 | 352.7 | 248.1 | 339.5 | 238.8 | |
| 20 | POLYIMIDE-DF-ISO | 1220.9 | 858.7 | 872.1 | 613.3 | 847.8 | 596.3 | 744.4 | 523.6 | 678.3 | 477.0 | |
| 21 | POLY(ARYLETHERETHERKETONE) | 5128.5 | 3606.9 | 3590.0 | 2524.8 | 2991.6 | 2104.0 | 2111.7 | 1485.2 | 1795.0 | 1262.4 | |
| 22 | LIQUID CRYSTAL POLYMER | 4726.4 | 3324.0 | 3676.1 | 2585.4 | 3308.5 | 2326.8 | 1654.2 | 1163.4 | 1323.4 | 930.7 | |
| 23 | 66 NYLON, POLYAMIDE | 327.6 | 230.4 | 213.7 | 150.3 | 196.6 | 138.2 | 175.5 | 123.4 | 49.1 | 34.6 | |

## CREEP OF ENGINEERING PLASTICS IN SYNTHETIC LUBRICANT / REFRIGERANT ENVIRONMENT

**[14 DAY CREEP AT 20 DEG. C. (68 DEG. F.) IN 32 ISO VG BRANCHED ACID, POLYOL ESTER WITH 40% HFC–134a (R–134a) BY WEIGHT]**

**TABLE D–3**

| NO. | TYPE | HFC–134a (R–134a) equilibrium test pressure = 65 psi<br>Creep Modulus<br>time (hours) | | | | | | | | | | time of break or start of yielding |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10 | | 50 | | 100 | | 200 | | 300 | | |
| | | ksi | kg/mm^2 | ksi | kg/mm^2 | ksi | kg/mm^2 | ksi | kg/mm^2 | ksi | kg/mm^2 | |
| 1 | POLYPHTHALAMIDE | 1689.5 | 1188.2 | 1305.5 | 918.2 | 667.9 | 469.8 | 522.2 | 367.3 | 478.7 | 336.7 | |
| 2 | ACRYLONITRILE–BUTADIENE–STYRENE TERPOLYMER | – | – | – | – | – | – | – | – | – | – | broke @ 1 hr |
| 3 | ACETAL | 12192.0 | 8574.6 | 1524.0 | 1071.8 | 937.8 | 659.6 | 530.1 | 372.8 | 451.6 | 317.6 | |
| 4 | PHENOLIC | 5382.3 | 3785.4 | 4305.9 | 3028.3 | 4305.9 | 3028.3 | 3588.2 | 2523.6 | 3075.6 | 2163.1 | |
| 5 | POLYVINYLIDENE FLUORIDE | 487.6 | 342.9 | 330.9 | 232.7 | 285.1 | 200.5 | 268.5 | 188.9 | 253.8 | 178.5 | |
| 6 | POLYCARBONATE | 3183.8 | 2239.2 | 2830.1 | 1990.4 | 2547.1 | 1791.4 | 1698.1 | 1194.2 | 1415.0 | 995.2 | |
| 7 | MODIFIED POLYPHENYLENE OXIDE | – | – | – | – | – | – | – | – | – | – | broke @ 1 hr |
| 8 | POLYPROPYLENE | 2248.8 | 1581.5 | 749.6 | 527.2 | 481.9 | 338.9 | 329.1 | 231.4 | 293.3 | 206.3 | |
| 9 | POLYARYL SULFONE | 4300.1 | 3024.2 | 2272.9 | 1598.5 | 1272.8 | 895.2 | 521.6 | 366.9 | 442.0 | 310.8 | |
| 10 | POLYETHYLENE TEREPHTHALATE | 7389.0 | 5196.7 | 5747.0 | 4041.8 | 4310.2 | 3031.4 | 3978.7 | 2798.2 | 3232.7 | 2273.5 | |
| 11 | POLYPHENYLENESULFIDE | 6253.4 | 4398.0 | 3385.6 | 2381.1 | 2920.6 | 2054.0 | 2416.1 | 1699.2 | 2044.4 | 1437.8 | |
| 13 | POLYAMIDE–IMIDE | 13959.9 | 9818.0 | 4653.3 | 3272.7 | 3172.7 | 2231.4 | 2684.6 | 1888.1 | 2102.4 | 1478.6 | |
| 14 | POLYAMIDE–IMIDE | 11495.0 | 8084.4 | 5225.0 | 3674.7 | 3193.1 | 2245.7 | 3025.0 | 2127.5 | 2498.9 | 1757.5 | |
| 15 | POLYETHERIMIDE | 7875.0 | 5538.5 | 3028.8 | 2130.2 | 2460.9 | 1730.8 | 1875.0 | 1318.7 | 1640.6 | 1153.9 | |
| 16 | MODIFEID POLYETHERIMIDE | 7245.5 | 5095.8 | 1906.7 | 1341.0 | 1575.1 | 1107.8 | 1449.1 | 1019.2 | 1065.5 | 749.4 | |
| 17 | POLYARYLETHERKETONE | 7472.8 | 5255.6 | 5337.7 | 3754.0 | 4670.5 | 3284.8 | 4670.5 | 3284.8 | 4395.8 | 3091.5 | |
| 18 | POLYBUTYLENE TEREPHTHALATE | 793.6 | 558.1 | 757.2 | 532.6 | 586.3 | 412.3 | 562.0 | 395.2 | 534.5 | 375.9 | |
| 19 | POLYIMIDE–DF | 3880.2 | 2729.0 | 2771.6 | 1949.3 | 2716.2 | 1910.3 | 1509.0 | 1061.3 | 1180.9 | 830.6 | |
| 20 | POLYIMIDE–DF–ISO | 7630.6 | 5366.6 | 3052.2 | 2146.6 | 2347.9 | 1651.3 | 1907.6 | 1341.6 | 1327.1 | 933.3 | |
| 21 | POLY(ARYLETHERETHERKETONE) | 17949.8 | 12624.1 | 17949.8 | 12624.1 | 17095.0 | 12022.9 | 10558.7 | 7425.9 | 8756.0 | 6158.1 | |
| 22 | LIQUID CRYSTAL POLYMER | 8271.1 | 5817.1 | 8135.6 | 2908.5 | 3007.7 | 2115.3 | 1946.1 | 1368.7 | 1654.2 | 1163.4 | |
| 23 | 66 NYLON, POLYAMIDE | 1228.5 | 864.0 | 792.6 | 557.4 | 491.4 | 345.6 | 446.7 | 314.2 | 396.3 | 278.7 | |

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG MINERAL OIL AND HCFC-22 (R-22)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]

TABLE E-1

| NO. | TYPE | PARTIC-ULATES b. | CRACK-ING b. | CRAZ-ING b. | SOFTEN-ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN-CREAM/ALMOND | -1.24 | -0.13 | -0.78 | -1.12 |
| 3 | ACETAL | 0 | 3 | 0 | 0 | WHITE/CREAM | -3.88 | -3.41 | -0.79 | -9.57 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | -0.61 | -0.54 | 0.00 | -3.29 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE-HAZY/CHOC. | -0.19 | 0.14 | 0.79 | 0.25 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | LUCITE-HAZY/WHITE | 3.62 | 3.80 | 4.72 | 14.73 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.13 | 0.39 | 0.78 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | -0.13 | -0.13 | -1.56 | 0.67 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | NONE | -0.08 | 0.00 | 0.39 | 0.09 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.66 | -0.31 | 2.07 | 1.46 |
| 13 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.11 | -0.13 | -0.39 | -0.99 |
| 14 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.04 | -0.13 | -0.38 | -0.69 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.00 | 0.39 | 0.71 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | -0.05 | 0.21 | 0.63 | 0.58 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | GRAY-GREEN/BROWN | -0.06 | 0.00 | 0.39 | 0.17 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0 | 3 | 0 | 0 | NONE | 0.12 | 0.14 | 0.00 | 2.68 |
| 19 | POLYIMIDE-DF | 0 | 0 | 0 | 0 | NONE | 0.10 | 0.15 | -0.48 | 0.80 |
| 20 | POLYIMIDE-DF-ISO | 0 | 0 | 0 | 0 | NONE | -0.06 | 0.00 | -0.96 | -0.35 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | 0.09 | 0.00 | 0.39 | 0.72 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | 0.03 | 0.00 | 0.00 | 0.02 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 0 | CREAM/YELLOW | -0.40 | 0.00 | -0.39 | 1.54 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F.)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG BRANCHED ACID POLYOL ESTER AND HFC-32 (R-32)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]

TABLE E-2

| NO. | TYPE | PARTIC-ULATES b. | CRACK-ING b. | CRAZ-ING b. | SOFTEN-ING b. | COLOR CHANGE | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN-CREAM/ALMOND | -1.10 | -0.54 | -0.39 | -1.29 |
| 3 | ACETAL | 0 | 0 | 0 | 0 | WHITE/YELLOW | -0.01 | 0.14 | 0.79 | 0.37 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | -0.63 | -0.40 | 0.00 | -3.83 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 1 | LUCITE-HAZY/GRAY | 1.86 | 2.17 | 2.78 | 3.76 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | NONE | 0.68 | 0.81 | 1.57 | 2.97 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.00 | 0.78 | -0.26 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | -0.17 | -0.27 | 0.39 | -0.46 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | NONE | -0.04 | -0.13 | 0.78 | 0.09 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.08 | 0.73 | 0.38 | 0.23 |
| 13 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.11 | -0.13 | 0.00 | -1.41 |
| 14 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.11 | -0.13 | 0.77 | -0.80 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | -0.17 | 0.40 | 0.78 | 0.51 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | -0.03 | 0.00 | 0.63 | 0.32 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | -0.17 | 0.14 | 0.78 | -0.09 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 1 | 0 | 0 | 0 | NONE | -0.35 | 0.27 | 1.18 | 0.47 |
| 19 | POLYIMIDE-DF | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.15 | 0.00 | 0.03 |
| 20 | POLYIMIDE-DF-ISO | 0 | 0 | 0 | 0 | NONE | -0.12 | -0.30 | 0.00 | -0.94 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | -0.11 | 0.27 | 0.79 | -0.17 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | -0.03 | -0.13 | 0.00 | -0.05 |
| 23 | 66 NYLON, POLYAMIDE | 1 | 0 | 0 | 0 | NONE | -0.66 | -0.67 | 0.00 | -1.32 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG POLYPROPYLENE GLYCOL BUTYL MONO ETHER AND HFC-32 (R-32)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]

TABLE E-3

| NO. | TYPE | PARTIC-ULATES b. | CRACK-ING b. | CRAZ-ING b. | SOFTEN-ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN-CREAM/CREAM | -1.19 | -0.81 | 0.00 | -1.45 |
| 3 | ACETAL | 1 | 0 | 0 | 0 | WHITE/LIGHT YELLOW | -0.19 | 0.00 | 0.40 | 0.04 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | -0.70 | -0.67 | -0.77 | -4.09 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE-HAZY/LT.YELLOW | 0.01 | 0.14 | 1.19 | 0.91 |
| 6 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | WHITE/LIGHT FLESH | 0.24 | 0.00 | 0.00 | 1.18 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | -0.17 | -0.13 | 0.39 | -0.74 |
| 10 | POLYETHYLENE TEREPHTHALATE | 1 | 0 | 0 | 0 | NONE | -0.11 | -0.27 | 0.00 | -0.32 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | NONE | -0.14 | -0.13 | 0.79 | 0.13 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.14 | 0.21 | 0.00 | 0.30 |
| 13 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.16 | 0.00 | 0.00 | -1.09 |
| 14 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.21 | -0.13 | 0.00 | -0.84 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | 0.04 | 0.00 | 0.39 | 0.42 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.11 | 0.31 | 0.45 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | -0.06 | -0.14 | 0.39 | 0.09 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 2 | 0 | 0 | 0 | NONE | -0.65 | 0.00 | 0.00 | -0.14 |
| 19 | POLYIMIDE-DF | 0 | 0 | 0 | 0 | NONE | -0.16 | -0.15 | 0.00 | -0.89 |
| 20 | POLYIMIDE-DF-ISO | 0 | 0 | 0 | 0 | NONE | -0.15 | -0.15 | 0.00 | -0.89 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.00 | 0.00 | 0.26 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | -0.07 | -0.13 | 0.01 | -0.11 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 0 | NONE | -0.69 | -0.27 | -0.39 | -1.32 |

Note:
a. Aging temperature = 100 Deg.C
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG MINERAL OIL AND HCFC-123 (R-123)

[14 DAYS AT 105 DEG.C. (221 DEG.F.) AT 275-300 PSIA]

TABLE E-4a

| NO. | TYPE | PARTIC-ULATES b. | CRACK-ING b. | CRAZ-ING b. | SOFTEN-ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN-CREAM/ALMOND | -0.76 | -1.15 | 0.78 | 0.08 |
| 3 | ACETAL | 0 | 3 | 0 | 0 | WHITE/YELLOW-TAN | 0.78 | 0.40 | 1.59 | 5.40 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.00 | 0.00 | 0.33 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 1 | LUCITE-HAZY/TAN | 1.72 | 1.57 | 1.59 | 5.10 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | LUCITE-HAZY/WHITE | 4.73 | 4.32 | 5.56 | 22.59 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.78 | 0.79 | 0.06 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | -0.23 | 0.39 | 0.00 | 4.13 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | CHOC./LIGHT-CHOC. | -0.10 | 0.00 | -0.39 | 0.10 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 1.45 | 0.01 | -0.43 | 4.21 |
| 13 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | 0.03 | 0.00 | -0.39 | -0.09 |
| 14 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.38 | -0.38 | 0.08 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | -0.07 | 0.39 | 0.00 | 0.08 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.00 | 0.31 | 0.26 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | -0.10 | -0.38 | 0.00 | -0.36 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | WHITE/FLESH | 1.51 | 1.92 | 2.36 | 8.33 |
| 19 | POLYIMIDE-DF | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.00 | 0.00 | 0.02 |
| 20 | POLYIMIDE-DF-ISO | 0 | 0 | 0 | 0 | NONE | -0.04 | 0.23 | 0.00 | -0.62 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | 0.10 | 0.00 | 0.00 | -0.02 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | 0.20 | 0.79 | 0.79 | -0.02 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 0 | CREAM/LIGHT-BROWN | 0.26 | 0.00 | 0.00 | 2.56 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG MINERAL OIL AND HCFC–123 (R–123)

[14 DAYS AT 125 DEG.C. (257 DEG.F.) AT 275–300 PSIA]

TABLE E–4b

| NO. | TYPE | PARTIC–ULATES b. | CRACK–ING b. | CRAZ–ING b. | SOFTEN–ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN–CREAM/ALMOND | –0.86 | –0.13 | 0.00 | 0.34 |
| 3 | ACETAL | 3 | 3 | 3 | 3 | NONE | FAILED | FAILED | FAILED | FAILED |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | –0.06 | 0.27 | 0.77 | –0.29 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE–HAZY/TAN | 1.11 | 0.95 | 1.19 | 3.47 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 3 | LUCITE–HAZY/WHITE | 6.41 | 13.50 | 35.97 | 50.53 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | –0.09 | 0.13 | –0.78 | –0.19 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | LT.TAN/LT.BROWN | –0.18 | 0.54 | 0.79 | 3.19 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | CHOCOLATE/BROWN | –0.21 | –0.13 | 0.78 | 0.14 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.86 | 0.32 | –0.41 | 2.14 |
| 13 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | 0.03 | 0.13 | 0.00 | –0.38 |
| 14 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.06 | 0.27 | 0.00 | –0.26 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.30 | 0.00 | 0.00 | –0.17 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.50 | –0.16 | 0.31 | –0.47 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | –0.09 | –0.13 | 0.78 | –0.19 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0 | 3 | 0 | 0 | NONE | 1.76 | 1.86 | 2.31 | 8.38 |
| 19 | POLYIMIDE–DF | 0 | 0 | 0 | 0 | NONE | –0.03 | 0.00 | –1.43 | –0.18 |
| 20 | POLYIMIDE–DF–ISO | 0 | 0 | 0 | 0 | NONE | –0.07 | 0.00 | –1.43 | –0.55 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | –0.06 | 0.00 | 0.39 | 0.01 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | 0.00 | –0.27 | 0.39 | –0.20 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 0 | CREAM/LT.BROWN | 0.24 | 0.41 | 0.39 | 2.72 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG ALKYLBENZENE AND HCFC-124 (R-124)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]

TABLE E-5

| NO. | TYPE | PARTIC-ULATES b. | CRACK-ING b. | CRAZ-ING b. | SOFTEN-ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN-CREAM/CREAM | -1.23 | -1.07 | -1.56 | -1.93 |
| 3 | ACETAL | 0 | 0 | 0 | 0 | WHITE/LIGHT YELLOW | -1.18 | -0.14 | -0.39 | -1.24 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | -0.68 | -0.94 | -1.54 | -4.36 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE-HAZY/LT.BROWN | 0.76 | 1.06 | 0.39 | 2.80 |
| 6 | POLYPROPYLENE a. | 0 | 0 | 0 | 1 | NONE | 3.13 | 3.39 | 3.11 | 14.39 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | -0.04 | -0.26 | 0.39 | -0.54 |
| 10 | POLYETHYLENE TEREPHTHALATE | 1 | 0 | 0 | 0 | NONE | -0.14 | -0.26 | -1.56 | -0.41 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | CHOCOLATE/BROWN | -0.24 | -1.06 | 0.00 | -0.03 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.04 | 0.30 | 0.38 | 0.21 |
| 13 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.33 | -0.26 | -0.77 | -1.67 |
| 14 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.38 | -1.58 | -0.76 | -1.32 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.00 | 0.00 | -0.57 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | -0.17 | -0.74 | 0.16 | -0.47 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | GREY-GREEN/DARKER | -0.09 | 0.00 | 0.00 | -0.38 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 1 | 0 | 0 | 0 | WHITE/LIGHT PEACH | -0.04 | 0.00 | 0.00 | 1.64 |
| 19 | POLYIMIDE-DF | 0 | 0 | 0 | 0 | NONE | -0.09 | 0.00 | 0.00 | -0.96 |
| 20 | POLYIMIDE-DF-ISO | 0 | 0 | 0 | 0 | NONE | -0.09 | 0.00 | -0.49 | -0.90 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | -0.43 | -0.94 | 0.00 | 0.02 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | 0.04 | 0.00 | 0.00 | -0.08 |
| 23 | 66 NYLON, POLYAMIDE | 1 | 0 | 0 | 0 | CREAM/GREY | -0.22 | 0.40 | 0.00 | -0.07 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG MODIFIED POLYGLYCOL AND HFC–125 (R–125)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]

TABLE E–6

| NO. | TYPE | PARTIC–ULATES b. | CRACK–ING b. | CRAZ–ING b. | SOFTEN–ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN–CREAM/CREAM | –1.30 | –1.74 | –4.87 | –1.75 |
| 3 | ACETAL | 0 | 0 | 0 | 0 | WHITE/YELLOW | –2.72 | –2.59 | –1.59 | –5.48 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | –0.81 | –2.64 | –0.38 | –4.48 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE–HAZY/BROWN | –0.07 | –0.41 | 0.79 | 1.12 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | NONE | 0.12 | –1.34 | 0.00 | 1.33 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | –0.20 | –1.46 | –0.39 | –0.86 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | LT. TAN/TAN | –0.31 | –0.53 | –0.78 | –0.39 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | CHOCOLATE/BROWN | –0.24 | –1.19 | 0.00 | –0.03 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.38 | –3.03 | 0.00 | 0.86 |
| 13 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.19 | –1.06 | 0.00 | –1.57 |
| 14 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.14 | –1.19 | –0.77 | –1.16 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.19 | –1.33 | 0.00 | –0.58 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.18 | –0.90 | –0.47 | –0.62 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | –0.17 | –0.80 | –0.39 | –0.38 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 2 | 0 | 0 | 0 | WHITE/CREAM | –0.56 | –0.40 | –0.38 | 0.06 |
| 19 | POLYIMIDE–DF | 0 | 0 | 0 | 0 | NONE | –0.12 | –0.15 | 0.00 | –0.93 |
| 20 | POLYIMIDE–DF–ISO | 0 | 0 | 0 | 0 | NONE | –0.18 | –1.81 | 0.00 | –0.97 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | –0.09 | –1.98 | 0.39 | –0.21 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | LT. TAN/TAN | –0.10 | –0.27 | 0.00 | –0.07 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 1 | CREAM/DARKER | –0.60 | –1.87 | –3.79 | –1.34 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG BRANCHED ACID POLYOL ESTER AND HFC–125 (R–125)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]

TABLE E–7

| NO. | TYPE | PARTIC–ULATES b. | CRACK–ING b. | CRAZ–ING b. | SOFTEN–ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN–CREAM/CREAM | –1.20 | –1.33 | –0.39 | –1.77 |
| 3 | ACETAL | 0 | 0 | 0 | 0 | WHITE/LT. YELLOW | 0.10 | –0.27 | 0.79 | 0.56 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | –0.71 | –2.12 | –0.77 | –4.56 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 1 | LUCITE–HAZY/DARKER | –2.02 | –1.19 | 0.78 | 2.76 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | NONE | 0.91 | 0.68 | 1.58 | 3.61 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | –0.11 | –0.93 | 0.00 | –0.83 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | –0.24 | –0.53 | 0.00 | –0.60 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | CHOCOLATE/BROWN | 2.83 | 1.35 | 0.79 | –0.05 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | –0.18 | –0.10 | 0.00 | 0.72 |
| 13 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.26 | –0.80 | 0.00 | –1.64 |
| 14 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.11 | –1.06 | –0.38 | –1.29 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.09 | –0.66 | 0.39 | –0.66 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.14 | –0.64 | 0.47 | –0.55 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | –0.24 | –0.81 | 0.00 | –0.41 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 1 | 0 | 0 | 0 | NONE | –0.37 | –0.67 | 0.00 | 0.16 |
| 19 | POLYIMIDE–DF | 0 | 0 | 0 | 0 | NONE | –0.10 | 0.15 | 0.49 | –0.96 |
| 20 | POLYIMIDE–DF–ISO | 0 | 0 | 0 | 0 | NONE | –0.10 | 0.00 | 0.00 | –0.96 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | –0.06 | –0.54 | 0.00 | –0.25 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | –0.04 | –0.80 | 0.00 | –0.09 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 0 | NONE | –0.66 | –1.20 | 0.00 | –1.79 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG POLYPROPYLENE GLYCOL BUTYL MONO ETHER AND HFC-125 (R-125)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]

TABLE E-8

| NO. | TYPE | PARTIC-ULATES b. | CRACK-ING b. | CRAZ-ING b. | SOFTEN-ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN-CREAM/CREAM | -1.30 | -0.81 | -1.17 | -1.77 |
| 3 | ACETAL | 0 | 0 | 0 | 0 | WHITE/YELLOW | -0.85 | -0.27 | 0.00 | -0.05 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | -0.92 | -1.21 | -0.77 | -3.82 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE-HAZY/YELLOW | -0.01 | 0.00 | 0.79 | 1.25 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | NONE | 0.19 | -0.14 | 0.40 | 1.40 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | -0.20 | -0.40 | 0.00 | -0.84 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | 0.04 | -0.27 | 0.00 | -0.57 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | CHOCOLATE/BROWN | -0.16 | -0.79 | 0.00 | -0.06 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.30 | 0.22 | 0.00 | 0.92 |
| 13 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.19 | -0.27 | 0.00 | -1.40 |
| 14 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.16 | -0.27 | 0.00 | -1.06 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | -0.31 | -0.53 | 0.01 | -0.54 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | -0.09 | -0.11 | 0.16 | -0.50 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | -0.09 | 0.00 | 0.00 | -0.42 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 1 | 0 | 0 | 0 | WHITE/LT.PINK | -0.53 | -0.40 | 0.00 | 0.12 |
| 19 | POLYIMIDE-DF | 0 | 0 | 0 | 0 | NONE | -0.12 | 0.15 | 0.00 | -0.83 |
| 20 | POLYIMIDE-DF-ISO | 0 | 0 | 0 | 0 | NONE | -0.09 | -0.30 | 0.00 | -0.77 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | -0.14 | -0.54 | 0.39 | -0.21 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.00 | 0.00 | -0.08 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 0 | NONE | -0.75 | -0.67 | 0.00 | -1.45 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG BRANCHED ACID POLYOL ESTER AND HFC–134 (R–134)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]

TABLE E–9

| NO. | TYPE | PARTIC–ULATES b. | CRACK–ING b. | CRAZ–ING b. | SOFTEN–ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN–CREAM/CREAM | –1.20 | –1.99 | –0.39 | –1.50 |
| 3 | ACETAL | 1 | 0 | 0 | 0 | WHITE/YELLOW | 0.45 | –0.14 | 0.79 | 1.93 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | –0.65 | –3.27 | –0.38 | –4.06 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 1 | LUCITE–HAZY/GREY | 1.47 | 1.22 | 4.37 | 3.53 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 1 | LUCITE–HAZY/WHITE | 0.78 | 0.13 | 0.79 | 3.95 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | –0.20 | 0.00 | 0.00 | –0.55 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | LT. TAN/LIGHTER | –0.16 | –1.98 | –0.39 | 0.50 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | CHOCOLATE/BROWN | –0.21 | –1.19 | 0.00 | –0.06 |
| 12 | POLYTETRAFLUOROETHYLANE | 0 | 0 | 0 | 0 | NONE | 0.33 | –0.40 | 0.84 | 0.95 |
| 13 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.31 | –0.40 | 0.39 | –1.52 |
| 14 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.18 | –1.06 | –0.38 | –1.05 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.09 | –0.80 | 0.00 | –0.23 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.07 | –0.32 | 1.58 | –0.28 |
| 17 | POLYETHERKETONE | 0 | 0 | 0 | 0 | NONE | –0.19 | –1.99 | 0.00 | –0.29 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 2 | 0 | 0 | 0 | NONE | 0.00 | –1.85 | 0.39 | 1.64 |
| 19 | POLYIMIDE–DF | 0 | 0 | 0 | 0 | NONE | –0.07 | 0.15 | 0.00 | –0.50 |
| 20 | POLYIMIDE–DF–ISO | 0 | 0 | 0 | 0 | NONE | –0.09 | 0.15 | –0.48 | –0.79 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | –0.24 | –0.13 | –0.39 | –0.23 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | 0.01 | –1.19 | 0.39 | –0.07 |
| 23 | 66 NYLON, POLYAMIDE | 1 | 0 | 0 | 0 | NONE | –0.66 | –2.12 | 0.00 | –0.89 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG MODIFIED POLYGLYCOL AND HFC–134a (R–134a)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]

TABLE E–10

| NO. | TYPE | PARTIC–ULATES b. | CRACK–ING b. | CRAZ–ING b. | SOFTEN–ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN–CREAM/ALMOND | –1.10 | –0.67 | 0.00 | –1.40 |
| 3 | ACETAL | 0 | 0 | 0 | 1 | WHITE/YELLOW | –4.07 | –2.88 | –0.40 | –9.22 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | –0.61 | –1.07 | –0.38 | –3.94 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 1 | LUCITE–HAZY/BROWN | 0.12 | 0.82 | 1.20 | 1.49 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | NONE | 0.27 | 0.14 | 0.79 | 1.78 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | –0.28 | 1.07 | 0.00 | –0.54 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | –0.11 | –0.67 | 0.00 | –0.07 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | NONE | –0.14 | –0.40 | 0.00 | 0.09 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.28 | –0.10 | 0.81 | 1.61 |
| 13 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.17 | –0.40 | 0.00 | –1.35 |
| 14 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.01 | –0.13 | 0.00 | –1.24 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.13 | –0.27 | 0.78 | –0.37 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.17 | 0.16 | 0.63 | –0.44 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | DARKER EDGES | –0.07 | 0.00 | 0.00 | –0.29 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | WHITE/ALMOND | –0.56 | –0.14 | 0.00 | 0.16 |
| 19 | POLYIMIDE–DF | 0 | 0 | 0 | 0 | NONE | –0.10 | –0.89 | 0.00 | –0.70 |
| 20 | POLYIMIDE–DF–ISO | 0 | 0 | 0 | 0 | NONE | –0.10 | 0.00 | –0.48 | –0.91 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | –0.21 | –0.27 | 0.00 | –0.17 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | –0.04 | 0.00 | 0.00 | –0.01 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 0 | CREAM/LIGHT TAN | –0.01 | –0.67 | 0.00 | –0.82 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG POLYPROPYLENE GLYCOL DIOL AND HFC-134a (R-134a)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]

TABLE E-11

| NO. | TYPE | PARTIC-ULATES b. | CRACK-ING b. | CRAZ-ING b. | SOFTEN-ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN-CREAM/ALMOND | -1.04 | -0.40 | -1.92 | -1.39 |
| 3 | ACETAL | 0 | 0 | 0 | 1 | WHITE/LT. YELLOW | 0.53 | 0.68 | -3.03 | 0.50 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | -0.64 | -0.80 | -1.90 | -3.96 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE/TAN | 1.56 | 1.63 | 0.41 | 3.62 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | NONE | 0.70 | 0.54 | 0.00 | 3.84 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | 0.03 | 0.00 | -1.52 | -0.46 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.54 | -0.78 | 0.83 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | CHOCOLATE/LIGHTER | -0.08 | 0.13 | -1.88 | 0.09 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.38 | 0.00 | -1.48 | 2.10 |
| 13 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | 0.04 | -0.53 | -0.38 | -1.41 |
| 14 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | 0.11 | -0.13 | -1.90 | -0.84 |
| 15 | POLYETHERIMIDE | 0 | 1 | 0 | 0 | NONE | 0.27 | 0.00 | -1.90 | -0.34 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 1 | 0 | 0 | NONE | -0.07 | -0.21 | -0.46 | -0.29 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | 0.04 | -0.13 | -1.92 | -0.33 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0 | 3 | 0 | 0 | WHITE/FLESH | 0.84 | 0.81 | -1.52 | 3.52 |
| 19 | POLYIMIDE-DF | 0 | 0 | 0 | 0 | NONE | -0.03 | -0.15 | -3.28 | -0.64 |
| 20 | POLYIMIDE-DF-ISO | 0 | 0 | 0 | 0 | NONE | -0.10 | -0.15 | -2.37 | -0.88 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.13 | -3.77 | -0.08 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | 0.06 | -0.27 | -0.78 | -0.17 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 0 | NONE | -0.37 | 0.14 | -1.54 | -0.59 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG BRANCHED ACID POLYOL ESTER AND HFC–134a (R–134a)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]

TABLE E–12

| NO. | TYPE | PARTIC–ULATES b. | CRACK–ING b. | CRAZ–ING b. | SOFTEN–ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN–CREAM/ALMOND | –1.21 | –0.81 | –0.78 | –1.85 |
| 3 | ACETAL | 0 | 0 | 0 | 0 | WHITE/CREAM | 0.16 | 0.21 | 0.79 | 0.82 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | –0.64 | –0.80 | –0.38 | –4.12 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE–HAZY/GRAY | 0.98 | 1.22 | 1.59 | 2.26 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | NONE | 0.99 | 0.81 | 0.79 | 4.15 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | –0.23 | 0.00 | 0.00 | –0.79 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | –0.06 | –0.27 | 0.00 | 0.06 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | NONE | –0.11 | –0.13 | 0.79 | 0.02 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.40 | –0.10 | 0.42 | 1.04 |
| 13 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.10 | –0.13 | 0.00 | –1.43 |
| 14 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.10 | 0.00 | 0.00 | –0.96 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.13 | –0.40 | 0.00 | –0.36 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.08 | –0.11 | 0.47 | –0.34 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | –0.24 | 0.00 | 0.00 | –0.28 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | –0.27 | 0.00 | 0.38 | 0.84 |
| 19 | POLYIMIDE–DF | 0 | 0 | 0 | 0 | NONE | –0.07 | 0.00 | 0.00 | –0.55 |
| 20 | POLYIMIDE–DF–ISO | 0 | 0 | 0 | 0 | NONE | –0.15 | 0.00 | 0.00 | –0.82 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | –0.20 | –0.27 | 0.78 | –0.15 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | –0.01 | –0.13 | 0.39 | –0.05 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 0 | NONE | –0.78 | –0.67 | 0.00 | –1.71 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 22 ISO VG MIXED-ACID POLYOL ESTER AND HFC-134a (R-134a)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]

TABLE E-13

| NO. | TYPE | PARTIC-ULATES b. | CRACK-ING b. | CRAZ-ING b. | SOFTEN-ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN-CREAM/ALMOND | -1.17 | -0.54 | 0.00 | -1.61 |
| 3 | ACETAL | 0 | 0 | 0 | 0 | WHITE/YELLOW | -0.19 | 0.41 | 0.80 | -0.08 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | -0.74 | -0.67 | 0.00 | -4.33 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE-HAZY/YELLOWED | 0.95 | 1.09 | 2.00 | 2.32 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | NONE | 1.01 | 1.22 | 1.59 | 4.37 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | -0.17 | -0.13 | 0.79 | -0.77 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | -0.09 | 0.14 | 0.40 | -0.04 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | NONE | -0.21 | 0.27 | 0.79 | 0.11 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.22 | 0.41 | 1.63 | 0.75 |
| 13 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | 0.10 | 0.00 | 0.00 | -1.49 |
| 14 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.11 | 0.00 | 0.00 | -1.03 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.00 | 1.18 | -0.43 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | -0.25 | 0.00 | 1.10 | -0.40 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | -0.10 | 0.14 | 1.18 | -0.26 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | -0.33 | 0.00 | 1.56 | 0.66 |
| 19 | POLYIMIDE-DF | 0 | 0 | 0 | 0 | NONE | -0.15 | -0.30 | -0.48 | -0.89 |
| 20 | POLYIMIDE-DF-ISO | 0 | 0 | 0 | 0 | NONE | -0.12 | 0.00 | 0.00 | -0.81 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | -0.07 | 0.41 | 1.19 | -0.07 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | 0.00 | -0.13 | 0.39 | -0.01 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 0 | NONE | -0.59 | -0.27 | 0.39 | -1.04 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG POLYPROPYLENE GLYCOL BUTYL MONO ETHER AND HFC–134a (R–134a)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]

TABLE E–14

| NO. | TYPE | PARTIC–ULATES b. | CRACK–ING b. | CRAZ–ING b. | SOFTEN–ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN–CREAM/ALMOND | –1.07 | –0.67 | –1.17 | –1.26 |
| 3 | ACETAL | 0 | 0 | 0 | 0 | WHITE/LIGHT YELLOW | –0.70 | –0.27 | –0.39 | –1.13 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | –0.57 | –0.94 | –1.16 | –4.60 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE/TAN | 0.61 | 1.09 | –0.78 | 2.05 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | NONE | 0.58 | 0.54 | –1.54 | 3.00 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | –0.20 | –0.13 | 0.78 | –0.66 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | 0.06 | 0.40 | –0.78 | 0.54 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | CHOCOLATE/LIGHTER | –0.08 | 0.27 | –1.53 | 0.00 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.32 | 0.61 | 0.00 | 0.86 |
| 13 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | 0.27 | –0.13 | –4.07 | –1.45 |
| 14 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | 0.03 | –0.13 | 0.00 | –0.88 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | 0.26 | 0.27 | –0.77 | –0.67 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | 0.00 | 0.11 | –0.61 | –0.27 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | –0.07 | –0.27 | 0.00 | –0.31 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | WHITE/FLESH | –0.56 | –0.54 | –1.53 | 0.56 |
| 19 | POLYIMIDE–DF | 0 | 0 | 0 | 0 | NONE | –0.03 | 0.00 | –0.96 | –0.59 |
| 20 | POLYIMIDE–DF–ISO | 0 | 0 | 0 | 0 | NONE | –0.[illegible]0 | 0.00 | –0.48 | –0.84 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | 0.01 | 0.13 | –0.78 | –0.01 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | 0.07 | –0.27 | –1.17 | –0.03 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 0 | NONE | –0.24 | –0.27 | –1.16 | –0.94 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG ALKYLBENZENE AND HCFC-142b (R-142b)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]

TABLE E-15

| NO. | TYPE | PARTIC-ULATES b. | CRACK-ING b. | CRAZ-ING b. | SOFTEN-ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN-CREAM/CREAM | -1.26 | -0.67 | -0.39 | -1.55 |
| 3 | ACETAL | 0 | 0 | 0 | 0 | WHITE/LT. YELLOW | -0.60 | -0.41 | 0.00 | -0.69 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | -0.48 | -1.46 | -0.38 | -2.65 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE-HAZY/YEL-BR'N | 0.90 | 1.63 | 1.19 | 2.54 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 0 | LUCITE-HAZY/WHITE | 3.59 | 3.76 | 4.33 | 15.13 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | -0.13 | 0.00 | 0.78 | -0.58 |
| 10 | POLYETHYLENE TEREPHTHALATE | 2 | 0 | 0 | 0 | LIGHT TAN/LIGHTER | 0.31 | -0.26 | 0.00 | 0.62 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | CHOCOLATE/BROWN | -0.20 | -0.53 | 0.39 | 0.30 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.32 | -0.91 | 2.09 | 1.22 |
| 13 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.16 | 0.00 | -0.39 | -1.53 |
| 14 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.11 | -0.26 | 0.00 | -1.20 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | -0.20 | 0.00 | 0.00 | -0.37 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | -0.11 | -0.48 | 0.94 | -0.29 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | -0.07 | 0.53 | 0.39 | -0.29 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 1 | 0 | 0 | 0 | WHITE/LIGHT FLESH | 0.06 | 0.27 | 0.00 | 1.73 |
| 19 | POLYIMIDE-DF | 0 | 0 | 0 | 0 | NONE | 0.06 | 0.30 | 0.00 | -0.31 |
| 20 | POLYIMIDE-DF-ISO | 0 | 0 | 0 | 0 | NONE | -0.13 | 0.00 | 0.00 | -0.86 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | -0.21 | -0.67 | 0.78 | 0.10 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | 0.06 | -0.13 | -0.39 | -0.06 |
| 23 | 66 NYLON, POLYAMIDE | 1 | 0 | 0 | 0 | NONE | -0.80 | -1.73 | 0.01 | -1.73 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG BRANCHED ACID POLYOL ESTER AND HFC–143a (R–143a)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]

TABLE E–16

| NO. | TYPE | PARTIC–ULATES b. | CRACK–ING b. | CRAZ–ING b. | SOFTEN–ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN–CREAM/CREAM | –1.23 | –1.34 | 0.00 | –1.63 |
| 3 | ACETAL | 1 | 0 | 0 | 0 | WHITE/LT. YELLOW | 0.10 | –0.40 | 1.19 | 0.73 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | –0.97 | –2.24 | –0.77 | –4.18 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE–HAZY/GREY | 1.21 | 1.08 | 2.38 | 2.64 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 1 | NONE | 0.75 | 0.68 | 0.39 | 4.00 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | –0.18 | –0.53 | 0.00 | –0.81 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | LT. TAN/LIGHTER | –0.17 | –0.66 | 0.40 | –0.12 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | CHOCOLATE/BROWN | –0.42 | –0.53 | 0.78 | –0.10 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.30 | –1.72 | 1.24 | 1.12 |
| 13 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.24 | –0.93 | 0.00 | –1.59 |
| 14 | POLYAMIDE–IMIDE | 0 | 0 | 0 | 0 | NONE | –0.20 | –0.53 | 0.00 | –1.15 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.23 | –0.53 | 0.00 | –0.41 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | –0.16 | –1.01 | 0.31 | –0.34 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | –0.13 | –2.12 | 0.00 | 0.12 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 2 | 0 | 0 | 0 | NONE | –0.55 | –0.40 | 0.00 | 0.47 |
| 19 | POLYIMIDE–DF | 0 | 0 | 0 | 0 | NONE | –0.10 | 0.00 | 0.00 | –0.64 |
| 20 | POLYIMIDE–DF–ISO | 0 | 0 | 0 | 0 | NONE | –0.10 | 0.15 | 0.49 | 1.07 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | –0.19 | –1.33 | 0.00 | –0.22 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | –0.07 | –0.27 | 0.00 | –0.06 |
| 23 | 66 NYLON, POLYAMIDE | 1 | 0 | 0 | 0 | NONE | –0.88 | –0.54 | 0.00 | –1.77 |

Note:
a. Aging temperature = 100 Deg.C ( 2 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## PHYSICAL CHANGES IN PLASTICS EXPOSED TO 32 ISO VG ALKYLBENZENE AND HFC-152a (R-152a)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]

TABLE E-17

| NO. | TYPE | PARTIC-ULATES b. | CRACK-ING b. | CRAZ-ING b. | SOFTEN-ING b. | COLOR CHANGE AFTER AGING | AVERAGE% LENGTH CHANGE c. | AVERAGE% WIDTH CHANGE c. | AVERAGE% THICKNESS CHANGE c. | AVERAGE% WEIGHT CHANGE c. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | POLYPHTHALAMIDE | 0 | 0 | 0 | 0 | GREEN-CREAM/CREAM | -1.14 | -0.81 | -0.78 | -1.10 |
| 3 | ACETAL | 2 | 0 | 0 | 1 | WHITE/CREAM | -1.50 | -0.68 | 3.97 | -4.79 |
| 4 | PHENOLIC | 0 | 0 | 0 | 0 | NONE | -0.55 | -1.07 | 0.00 | -4.30 |
| 5 | POLYVINYLIDENE FLUORIDE | 0 | 0 | 0 | 0 | LUCITE-HAZY/LT.TAN | -0.19 | 0.14 | 1.19 | 0.41 |
| 8 | POLYPROPYLENE a. | 0 | 0 | 0 | 1 | NONE | 3.06 | 3.67 | 4.35 | 11.09 |
| 9 | POLYARYL SULFONE | 0 | 0 | 0 | 0 | NONE | -0.17 | 0.27 | 0.78 | -0.11 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | NONE | -0.17 | 0.00 | 0.39 | 0.08 |
| 11 | POLYPHENYLENESULFIDE | 0 | 0 | 0 | 0 | NONE | 0.11 | 0.00 | 0.00 | 0.25 |
| 12 | POLYTETRAFLUOROETHYLENE | 0 | 0 | 0 | 0 | NONE | 0.12 | 0.31 | 0.83 | 0.58 |
| 13 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.16 | -0.27 | 0.39 | -1.44 |
| 14 | POLYAMIDE-IMIDE | 0 | 0 | 0 | 0 | NONE | -0.18 | -0.27 | 0.00 | -1.08 |
| 15 | POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | 0.13 | 0.13 | 0.39 | -0.14 |
| 16 | MODIFIED POLYETHERIMIDE | 0 | 0 | 0 | 0 | NONE | -0.07 | 0.27 | 0.94 | 0.14 |
| 17 | POLYARYLETHERKETONE | 0 | 0 | 0 | 0 | NONE | -0.19 | -0.27 | 0.39 | -0.12 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0 | 0 | 0 | 0 | WHITE/FLESH | -0.33 | -0.54 | 0.00 | 0.62 |
| 19 | POLYIMIDE-DF | 0 | 0 | 0 | 0 | NONE | -0.04 | -0.15 | 0.49 | -0.48 |
| 20 | POLYIMIDE-DF-ISO | 0 | 0 | 0 | 0 | NONE | -1.52 | -0.15 | 0.00 | -0.52 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0 | 0 | 0 | 0 | NONE | -0.11 | 0.14 | 0.78 | 0.25 |
| 22 | LIQUID CRYSTAL POLYMER | 0 | 0 | 0 | 0 | NONE | -0.01 | 0.27 | 0.00 | -0.04 |
| 23 | 66 NYLON, POLYAMIDE | 0 | 0 | 0 | 0 | NONE | -0.70 | -0.40 | 0.00 | -1.71 |

Note:
a. Aging temperature = 100 Deg.C (212 Deg.F)
b. Qualitative scale: 0=no change, 1=slight, 2=large, 3=dissolved, deformed or melted
c. % Change = change in before/after measurements of plastics

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG MINERAL OIL AND HCFC–22 (R–22)

**[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]**

**TABLE F–1**

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS–SECTIONAL AREA | | TENSILE | | | TENSILE | | | | |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | % ELONGATION | lbm/in^2 | kg/mm^2 | % ELONG. | TENSILE | % ELONG. |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 8953 | 6.29 | 8.46 | –22.07 | –78.46 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 4415 | 3.10 | 11.42 | –54.74 | –49.48 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 7171 | 5.04 | 6.10 | –16.78 | –5.49 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 7102 | 4.99 | 61.42 | –4.18 | –41.73 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 4865 | 3.42 | 413.98 | –9.86 | 11.06 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 14646 | 10.30 | 25.20 | 15.07 | –64.09 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 7039 | 4.95 | 7.87 | –65.98 | –36.91 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 24908 | 17.51 | 12.99 | 17.15 | 26.92 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 4998 | 3.51 | 253.54 | 28.86 | –3.48 |
| 13 | POLYAMIDE–IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 13668 | 9.61 | 22.44 | –41.86 | 30.73 |
| 14 | POLYAMIDE–IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 20539 | 14.44 | 18.50 | –10.66 | –8.20 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 15957 | 11.22 | 68.90 | 1.31 | 7.10 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 14998 | 10.54 | 47.32 | 6.50 | 2.04 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16249 | 11.42 | 64.96 | 8.72 | 4.30 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | N/A | N/A | N/A | N/A | N/A |
| 19 | POLYIMIDE–DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 10433 | 7.34 | 17.72 | –3.97 | –22.01 |
| 20 | POLYIMIDE–DF–ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 11346 | 7.98 | 15.35 | –7.07 | –14.66 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 14848 | 10.44 | 64.76 | 3.40 | –13.69 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14192 | 9.98 | 10.24 | 13.65 | –1.14 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | N/A | N/A | N/A | N/A | N/A |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG BRANCHED ACID POLYOL ESTER AND HFC-32 (R-32)
## [14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]
## TABLE F-2

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS-SECTIONAL AREA | | TENSILE | | % ELONGATION | TENSILE | | % ELONG. | TENSILE | % ELONG. |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | | lbm/in^2 | kg/mm^2 | | | |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 14312 | 10.06 | 11.61 | 24.58 | -70.44 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 9485 | 6.67 | 22.44 | -2.77 | -0.70 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 8051 | 5.66 | 4.53 | -6.57 | -29.88 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6198 | 4.36 | 115.94 | -16.37 | 10.01 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 16098 | 11.32 | 207.48 | 198.29 | -44.34 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 14308 | 10.06 | 29.92 | 12.41 | -57.35 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 18614 | 13.09 | 9.65 | -10.03 | -22.71 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 25238 | 17.74 | 9.06 | 18.70 | -11.54 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 3953 | 2.78 | 95.08 | 1.91 | -63.80 |
| 13 | POLYAMIDE-IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 28082 | 19.74 | 19.88 | 19.45 | 15.83 |
| 14 | POLYAMIDE-IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 22575 | 15.87 | 18.90 | -1.80 | -6.25 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16150 | 11.35 | 62.80 | 2.54 | -2.39 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 14780 | 10.39 | 38.68 | 4.96 | -16.60 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16098 | 11.32 | 56.10 | 7.71 | -9.92 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 7748 | 5.45 | 12.99 | 7.01 | -92.00 |
| 19 | POLYIMIDE-DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 11071 | 7.78 | 18.31 | 1.90 | -19.41 |
| 20 | POLYIMIDE-DF-ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 11451 | 8.05 | 13.78 | -6.21 | -23.41 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 14737 | 10.36 | 64.96 | 2.63 | -13.43 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14503 | 10.20 | 11.02 | 16.13 | 6.46 |
| 23 | 6o NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 11129 | 7.82 | 28.35 | 10.27 | -65.13 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG POLYPROPYLENE GLYCOL BUTYL MONO ETHER AND HFC-32 (R-32)
## [14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]
## TABLE F-3

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS-SECTIONAL AREA | | TENSILE | | % ELONGATION | TENSILE | | % ELONG. | TENSILE | % ELONG. |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | | lbm/in^2 | kg/mm^2 | | | |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 14879 | 10.46 | 12.01 | 29.51 | -69.44 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 4505 | 3.17 | 22.83 | -53.81 | 1.05 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 5993 | 4.21 | 4.13 | -30.45 | -35.98 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6844 | 4.81 | 84.84 | -7.66 | -19.50 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 5193 | 3.65 | 188.58 | -3.78 | -49.41 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 14389 | 10.12 | 20.87 | 13.05 | -70.26 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 10693 | 7.52 | 6.89 | -48.32 | -44.79 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 25765 | 18.11 | 9.06 | 21.18 | -11.54 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 4263 | 3.00 | 257.48 | 9.92 | -1.98 |
| 13 | POLYAMIDE-IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 28580 | 20.09 | 19.69 | 21.56 | 14.68 |
| 14 | POLYAMIDE-IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 22135 | 15.56 | 18.50 | -3.72 | -8.20 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16385 | 11.52 | 45.47 | 4.03 | -29.31 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 15184 | 10.68 | 37.95 | 7.82 | -18.17 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16550 | 11.64 | 54.33 | 10.74 | -12.77 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 7152 | 5.03 | 7.87 | -1.21 | -95.15 |
| 19 | POLYIMIDE-DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 11107 | 7.81 | 17.52 | 2.23 | -22.88 |
| 20 | POLYIMIDE-DF-ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 10835 | 7.62 | 13.19 | -11.25 | -26.70 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 14005 | 9.85 | 42.32 | -2.47 | -43.60 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14406 | 10.13 | 9.06 | 15.35 | -12.55 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 11734 | 8.25 | 67.13 | 16.26 | -17.43 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG MINERAL OIL AND HCFC-123 (R-123)

**[14 DAYS AT 125 DEG.C. (257 DEG.F.) AT 275-300 PSIA.]**

**TABLE F-4a**

| NO | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS-SECTIONAL AREA | | TENSILE | | | TENSILE | | | | |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | % ELONGATION | lbm/in^2 | kg/mm^2 | % ELONG. | TENSILE | % ELONG. |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 12703 | 8.93 | 16.73 | 10.57 | -57.41 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | N/A | N/A | N/A | N/A | N/A |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 8129 | 5.72 | 11.02 | -5.66 | 70.73 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6379 | 4.48 | 114.17 | -13.94 | 8.33 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | N/A | N/A | N/A | N/A | N/A |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 13337 | 9.38 | 34.65 | 4.78 | -50.62 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 4985 | 3.51 | 4.53 | -75.90 | -63.72 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 23454 | 16.49 | 17.32 | 10.31 | 69.23 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 3485 | 2.45 | 299.80 | -10.14 | 14.13 |
| 13 | POLYAMIDE-IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 25421 | 17.87 | 25.00 | 8.13 | 45.64 |
| 14 | POLYAMIDE-IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 21770 | 15.31 | 24.41 | -5.31 | 21.09 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 15826 | 11.13 | 58.46 | 0.48 | -9.12 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 14856 | 10.45 | 52.60 | 5.50 | 13.41 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 15667 | 11.02 | 75.39 | 4.83 | 21.05 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | N/A | N/A | N/A | N/A | N/A |
| 19 | POLYIMIDE-DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 9948 | 6.99 | 22.24 | -8.44 | -2.08 |
| 20 | POLYIMIDE-DF-ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 3912 | 2.75 | 16.14 | -67.96 | -10.28 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 14969 | 10.52 | 66.54 | 4.24 | -11.33 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14478 | 10.18 | 9.25 | 15.93 | -10.65 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 8832 | 6.21 | 45.47 | -12.50 | -44.07 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG MINERAL OIL AND HCFC–123 (R–123)
## [14 DAYS AT 105 DEG.C. (221 DEG.F.) AT 275–300 PSIA]
## TABLE F–4b

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS–SECTIONAL AREA | | TENSILE | | | TENSILE | | | | |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | % ELONGATION | lbm/in^2 | kg/mm^2 | % ELONG. | TENSILE | % ELONG. |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 13028 | 9.16 | 19.69 | 13.39 | –49.90 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | N/A | N/A | N/A | N/A | N/A |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 10902 | 7.66 | 7.48 | 26.51 | 15.85 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6462 | 4.54 | 138.98 | –12.82 | 31.86 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 3709 | 2.61 | 166.34 | –31.28 | –55.38 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 13050 | 9.17 | 36.02 | 2.52 | –48.65 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 15809 | 11.11 | 11.42 | –23.59 | –8.52 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 24225 | 17.03 | 10.04 | 13.94 | –1.92 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 3328 | 2.34 | 312.99 | –14.21 | 19.15 |
| 13 | POLYAMIDE–IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 21587 | 15.18 | 16.93 | –8.18 | –1.38 |
| 14 | POLYAMIDE–IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 21700 | 15.26 | 19.49 | –5.61 | –3.32 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 15227 | 10.71 | 36.61 | –3.32 | –43.08 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 14809 | 10.41 | 50.08 | 5.16 | 7.98 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 15546 | 10.93 | 64.96 | 4.02 | 4.30 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 5425 | 3.81 | 34.84 | –25.06 | –78.55 |
| 19 | POLYIMIDE–DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 10263 | 7.22 | 17.72 | –5.53 | –22.01 |
| 20 | POLYIMIDE–DF–ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 11216 | 7.89 | 15.55 | –8.14 | –13.57 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 13742 | 9.66 | 47.44 | –4.30 | –36.78 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14564 | 10.24 | 10.24 | 16.62 | –1.14 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 10965 | 7.71 | 225.20 | 8.64 | 177.00 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG ALKYLBENZENE AND HCFC-124 (R-124)
### [14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]
### TABLE F-5

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS-SECTIONAL AREA | | TENSILE | | | TENSILE | | | | |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | % ELONGATION | lbm/in^2 | kg/mm^2 | % ELONG. | TENSILE | % ELONG. |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 14982 | 10.53 | 13.58 | 30.41 | -65.43 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 9364 | 6.58 | 19.09 | -3.99 | -15.51 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 6834 | 4.80 | 3.74 | -20.69 | -42.07 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6241 | 4.39 | 69.29 | -15.80 | -34.25 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 4847 | 3.41 | 394.09 | -10.20 | 5.72 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 14452 | 10.16 | 42.32 | 13.54 | -39.67 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 18997 | 13.36 | 9.45 | -8.18 | -24.29 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 24263 | 17.06 | 8.86 | 14.12 | -13.46 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 4123 | 2.90 | 303.15 | 6.31 | 15.41 |
| 13 | POLYAMIDE-IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 24473 | 17.21 | 14.96 | 4.10 | -12.84 |
| 14 | POLYAMIDE-IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 23180 | 16.30 | 20.08 | 0.83 | -0.39 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16282 | 11.45 | 52.76 | 3.38 | -17.99 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 15841 | 11.14 | 39.37 | 12.49 | -15.11 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16170 | 11.37 | 55.91 | 8.19 | -10.24 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 3552 | 2.50 | 4.72 | -50.94 | -97.09 |
| 19 | POLYIMIDE-DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 10603 | 7.45 | 17.13 | -2.41 | -24.61 |
| 20 | POLYIMIDE-DF-ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 7523 | 5.29 | 10.04 | -38.38 | -44.20 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 14463 | 10.17 | 60.24 | 0.72 | -19.73 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 15033 | 10.57 | 9.45 | 20.38 | -8.75 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 11310 | 7.95 | 38.19 | 12.06 | -53.03 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG BRANCHED ACID POLYOL ESTER AND HFC–125 (R–125)

### [14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]

### TABLE F–6

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS–SECTIONAL AREA | | TENSILE | | % ELONGATION | TENSILE | | % ELONG. | TENSILE | % ELONG. |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | | lbm/in^2 | kg/mm^2 | | | |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 14988 | 10.54 | 13.78 | 30.46 | -64.93 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 10165 | 7.15 | 22.64 | 4.22 | 0.17 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 7281 | 5.12 | 3.54 | -15.51 | -45.12 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6736 | 4.74 | 83.07 | -9.11 | -21.18 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 4945 | 3.48 | 183.07 | -8.37 | -50.89 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 14375 | 10.11 | 31.10 | 12.93 | -55.67 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 20560 | 14.46 | 10.24 | -0.62 | -17.98 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 23816 | 16.74 | 9.45 | 12.01 | -7.69 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 3521 | 2.48 | 175.20 | -9.23 | -33.30 |
| 13 | POLYAMIDE–IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 26187 | 18.41 | 16.34 | 11.39 | -4.82 |
| 14 | POLYAMIDE–IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 21785 | 15.32 | 17.91 | -5.24 | -11.13 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16891 | 11.88 | 40.94 | 7.24 | -36.35 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 15350 | 10.79 | 38.19 | 9.00 | -17.66 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16673 | 11.72 | 56.89 | 11.55 | -8.66 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 12814 | 9.01 | 11.81 | 76.99 | -92.73 |
| 19 | POLYIMIDE–DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 10372 | 7.29 | 18.70 | -4.53 | -17.68 |
| 20 | POLYIMIDE–DF–ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 10987 | 7.72 | 13.58 | -10.01 | -24.51 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 14663 | 10.31 | 39.57 | 2.11 | -47.27 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14647 | 10.30 | 9.25 | 17.29 | -10.65 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 12389 | 8.71 | 46.26 | 22.75 | -43.10 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG POLYPROPYLENE GLYCOL BUTYL MONO ETHER AND HFC-125 (R-125)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]

TABLE F-7

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS-SECTIONAL AREA | | TENSILE | | % ELONGATION | TENSILE | | % ELONG. | TENSILE | % ELONG. |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | | lbm/in^2 | kg/mm^2 | | | |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 15198 | 10.69 | 13.58 | 32.29 | -65.43 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 9819 | 6.90 | 4.33 | 0.67 | -80.84 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 9805 | 6.89 | 106.30 | 13.78 | 1546.34 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6850 | 4.82 | 106.30 | -7.58 | 0.86 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 4686 | 3.29 | 193.90 | -13.17 | -47.98 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 14508 | 10.20 | 18.11 | 13.98 | -74.19 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 16916 | 11.89 | 8.46 | -18.24 | -32.18 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 24859 | 17.48 | 8.86 | 16.92 | -13.46 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 9036 | 6.35 | 249.61 | 132.97 | -4.98 |
| 13 | POLYAMIDE-IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 28466 | 20.01 | 18.31 | 21.08 | 6.65 |
| 14 | POLYAMIDE-IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 21723 | 15.27 | 18.31 | -5.51 | -9.18 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16432 | 11.55 | 24.02 | 4.33 | -62.67 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 15495 | 10.89 | 26.97 | 10.04 | -41.85 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16147 | 11.35 | 54.92 | 8.04 | -11.82 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 6651 | 4.68 | 7.09 | -8.13 | -95.64 |
| 19 | POLYIMIDE-DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 10982 | 7.72 | 17.32 | 1.08 | -23.74 |
| 20 | POLYIMIDE-DF-ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 10279 | 7.23 | 11.81 | -15.80 | -34.35 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 15154 | 10.65 | 72.83 | 5.53 | -2.94 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14825 | 10.42 | 9.65 | 18.71 | -6.84 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 12013 | 8.45 | 34.45 | 19.02 | -57.63 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG MODIFIED POLYGLYCOL AND HFC–125 (R–125)
### [14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]
### TABLE F–8

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS -SECTIONAL AREA | | TENSILE | | % ELONGATION | TENSILE | | % ELONG. | TENSILE | % ELONG. |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | | lbm/in^2 | kg/mm^2 | | | |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 14539 | 10.22 | 14.76 | 26.55 | -62.42 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 8972 | 6.31 | 24.02 | -8.01 | 6.27 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 9798 | 6.89 | 24.02 | 13.71 | 271.95 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6869 | 4.83 | 90.75 | -7.32 | -13.90 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 4824 | 3.39 | 227.56 | -10.61 | -38.95 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 14321 | 10.07 | 35.24 | 12.52 | -49.78 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 20673 | 14.53 | 10.63 | -0.08 | -14.83 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 26219 | 18.43 | 9.45 | 23.32 | -7.69 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 3385 | 2.38 | 238.58 | -12.73 | -9.17 |
| 13 | POLYAMIDE–IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 22822 | 16.05 | 14.37 | -2.92 | -16.28 |
| 14 | POLYAMIDE–IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 21945 | 15.43 | 17.72 | -4.54 | -12.11 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16147 | 11.35 | 54.53 | 2.52 | -15.24 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 15287 | 10.75 | 37.80 | 8.56 | -18.51 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16254 | 11.43 | 45.08 | 8.75 | -27.62 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 7969 | 5.60 | 9.65 | 10.07 | -94.06 |
| 19 | POLYIMIDE–DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 11126 | 7.82 | 18.50 | 2.41 | -18.54 |
| 20 | POLYIMIDE–DF–ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 11152 | 7.84 | 13.58 | -8.65 | -24.51 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 14807 | 10.41 | 68.90 | 3.11 | -8.18 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14067 | 9.89 | 8.86 | 12.64 | -14.45 |
| 23 | 66 NYLON. POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 12067 | 8.48 | 36.42 | 19.56 | -55.21 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG BRANCHED ACID POLYOL ESTER AND HFC-134 (R-134)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]

TABLE F-9

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS-SECTIONAL AREA | | TENSILE | | % ELONGATION | TENSILE | | % ELONG. | TENSILE | % ELONG. |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | | lbm/in^2 | kg/mm^2 | | | |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 14603 | 10.27 | 14.37 | 27.11 | -63.43 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 9409 | 6.61 | 23.82 | -3.54 | 5.40 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 11261 | 7.92 | 5.51 | 30.68 | -14.63 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6342 | 4.46 | 118.90 | -14.43 | 12.81 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 5213 | 3.67 | 342.52 | -3.41 | -8.11 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 14231 | 10.01 | 25.00 | 11.81 | -64.37 |
| 10 | POLYETHYLENE TEREPHTHAL | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 19406 | 13.64 | 11.02 | -6.20 | -11.67 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 24898 | 17.51 | 9.45 | 17.10 | -7.69 |
| 12 | POLYTETRAFLUOROETHYLEN | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 4358 | 3.06 | 282.68 | 12.35 | 7.61 |
| 13 | POLYAMIDE-IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 27994 | 19.68 | 19.49 | 19.07 | 13.53 |
| 14 | POLYAMIDE-IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 22654 | 15.93 | 18.50 | -1.46 | -8.20 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16200 | 11.39 | 31.10 | 2.86 | -51.65 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 14991 | 10.54 | 35.98 | 6.46 | -22.41 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16435 | 11.55 | 26.18 | 9.96 | -57.96 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 7414 | 5.21 | 15.16 | 2.40 | -90.67 |
| 19 | POLYIMIDE-DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 9810 | 6.90 | 17.52 | -9.71 | -22.88 |
| 20 | POLYIMIDE-DF-ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 11496 | 8.08 | 14.57 | -5.84 | -19.04 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 14586 | 10.26 | 67.32 | 1.58 | -10.28 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14968 | 10.52 | 10.04 | 19.86 | -3.04 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 11615 | 8.17 | 47.24 | 15.08 | -41.89 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG BRANCHED ACID POLYOL ESTER AND HFC–134a (R–134a)

**[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]**

**TABLE F–10**

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS–SECTIONAL AREA | | TENSILE | | | TENSILE | | | | |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | % ELONGATION | lbm/in^2 | kg/mm^2 | % ELONG. | TENSILE | % ELONG. |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 15161 | 10.66 | 14.57 | 31.96 | –62.93 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 9882 | 6.95 | 23.43 | 1.32 | 3.66 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 10597 | 7.45 | 4.72 | 22.97 | –26.83 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6811 | 4.79 | 99.21 | –8.06 | –5.86 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 4650 | 3.27 | 312.20 | –13.84 | –16.24 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 8948 | 6.29 | 46.06 | –29.70 | –34.34 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 13739 | 9.66 | 8.46 | –33.59 | –32.18 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 24397 | 17.15 | 8.66 | 14.75 | –15.38 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 7099 | 4.99 | 267.32 | 83.04 | 1.77 |
| 13 | POLYAMIDE–IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 14139 | 9.94 | 21.06 | –39.86 | 22.71 |
| 14 | POLYAMIDE–IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 22385 | 15.74 | 18.31 | –2.63 | –9.18 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16271 | 11.44 | 44.29 | 3.31 | –31.15 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 15146 | 8.88 | 50.00 | –10.26 | 7.81 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 12637 | 8.88 | 7.48 | –15.45 | –87.99 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 6156 | 4.33 | 7.48 | –14.97 | –95.39 |
| 19 | POLYIMIDE–DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 10482 | 7.37 | 17.13 | –3.52 | –24.61 |
| 20 | POLYIMIDE–DF–ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 10875 | 7.65 | 13.19 | –10.92 | –26.70 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 15365 | 10.80 | 75.79 | 7.00 | 1.00 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14430 | 10.15 | 8.86 | 15.55 | –14.45 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 12163 | 8.55 | 45.47 | 20.51 | –44.07 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 22 ISO VG MIXED–ACID POLYOL ESTER AND HFC–134a (R–134a)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]

TABLE F–11

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS–SECTIONAL AREA | | TENSILE | | | TENSILE | | | | |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | % ELONGATION | lbm/in^2 | kg/mm^2 | % ELONG. | TENSILE | % ELONG. |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 15028 | 10.57 | 15.55 | 30.81 | –60.42 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 9866 | 6.94 | 25.59 | 1.15 | 13.24 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 11809 | 8.30 | 7.28 | 37.04 | 12.80 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6582 | 4.63 | 100.39 | –11.19 | –4.74 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 4729 | 3.33 | 256.30 | –12.37 | –31.24 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 7758 | 5.45 | 29.33 | –39.05 | –58.19 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 17410 | 12.24 | 12.20 | –15.85 | –2.21 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 24582 | 17.28 | 10.43 | 15.61 | 1.92 |
| 12 | POLYTETRAFLUOROETHYLEN | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 4118 | 2.90 | 240.16 | 6.18 | –8.57 |
| 13 | POLYAMIDE–IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 13667 | 9.61 | 21.26 | –41.87 | 23.85 |
| 14 | POLYAMIDE–IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 21275 | 14.96 | 18.70 | –7.46 | –7.23 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16222 | 11.40 | 39.76 | 2.99 | –38.19 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 15230 | 11.75 | 26.14 | 18.63 | –43.63 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16706 | 11.75 | 62.01 | 11.78 | –0.44 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 6744 | 4.74 | 10.24 | –6.84 | –93.70 |
| 19 | POLYIMIDE–DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 10613 | 7.46 | 19.69 | –2.32 | –13.34 |
| 20 | POLYIMIDE–DF–ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 11350 | 7.98 | 16.54 | –7.03 | –8.10 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 15173 | 10.67 | 72.64 | 5.67 | –3.20 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 12863 | 9.04 | 10.43 | 3.00 | 0.76 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 12073 | 8.49 | 36.02 | 19.61 | –55.69 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG POLYPROPYLENE GLYCOL BUTYL MONO ETHER AND HFC–134a (R–134a)

### [14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]

### TABLE F–12

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS–SECTIONAL AREA | | TENSILE | | % ELONGATION | TENSILE | | % ELONG. | TENSILE | % ELONG. |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | | lbm/in^2 | kg/mm^2 | | | |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 14893 | 10.47 | 170.28 | 29.64 | 333.37 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 9983 | 7.02 | 35.04 | 2.35 | 55.05 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 6741 | 4.74 | 6.69 | –21.77 | 3.66 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6561 | 4.61 | 114.96 | –11.48 | 9.08 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 4883 | 3.43 | 148.03 | –9.53 | –60.29 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 15628 | 10.99 | 28.43 | 22.78 | –59.48 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 6190 | 4.35 | 5.91 | –70.08 | –52.68 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 25318 | 17.80 | 10.24 | 19.08 | 0.00 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 3684 | 2.59 | 230.91 | –5.01 | –12.10 |
| 13 | POLYAMIDE–IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 21058 | 14.80 | 15.35 | –10.43 | –10.55 |
| 14 | POLYAMIDE–IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 47991 | 33.74 | 22.44 | 108.75 | 11.33 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16697 | 11.74 | 50.79 | 6.02 | –21.05 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 13995 | 9.84 | 29.13 | –0.62 | –37.18 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 15963 | 11.22 | 20.47 | 6.80 | –67.13 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | N/A | N/A | 0.00 | N/A | N/A |
| 19 | POLYIMIDE–DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 10653 | 7.49 | 18.50 | –1.95 | –18.54 |
| 20 | POLYIMIDE–DF–ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 11121 | 7.82 | 15.94 | –8.91 | –11.38 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 15439 | 10 85 | 74.80 | 7.51 | –0.31 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 13293 | 9.35 | 10.63 | 6.45 | 2.66 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 12178 | 8.56 | 49.21 | 20.66 | –39.47 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG MODIFIED POLYGLYCOL AND HFC–134a (R–134a)

### [14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]

TABLE F–13

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS–SECTIONAL AREA | | TENSILE | | | TENSILE | | | | |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | % ELONGATION | lbm/in^2 | kg/mm^2 | % ELONG. | TENSILE | % ELONG. |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 14728 | 10.36 | 15.16 | 28.20 | –61.42 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 8122 | 5.71 | 23.23 | –16.72 | 2.79 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 10731 | 7.54 | 7.09 | 24.53 | 9.76 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6177 | 4.34 | 106.30 | –16.66 | 0.86 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 4692 | 3.30 | 288.58 | –13.07 | –22.58 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 14899 | 10.47 | 21.46 | 17.05 | –69.42 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 6324 | 4.45 | 6.69 | –69.44 | –46.37 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 24483 | 17.21 | 10.43 | 15.15 | 1.92 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 3365 | 2.37 | 237.99 | –13.23 | –9.40 |
| 13 | POLYAMIDE–IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 14044 | 9.87 | 22.83 | –40.26 | 33.03 |
| 14 | POLYAMIDE–IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 22411 | 15.76 | 19.29 | –2.52 | –4.30 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 17031 | 11.97 | 58.07 | 8.13 | –9.73 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 15243 | 11.62 | 70.94 | 17.33 | 52.97 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16523 | 11.62 | 45.67 | 10.56 | –26.68 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 5182 | 3.64 | 8.27 | –28.42 | –94.91 |
| 19 | POLYIMIDE–DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 9188 | 6.46 | 19.69 | –15.43 | –13.34 |
| 20 | POLYIMIDE–DF–ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 11468 | 8.06 | 17.32 | –6.07 | –3.72 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 14278 | 10.04 | 42.13 | –0.57 | –43.86 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14307 | 10.06 | 11.02 | 14.56 | 6.46 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 11942 | 8.40 | 39.17 | 18.31 | –51.82 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG POLYPROPYLENE GLYCOL DIOL AND HFC–134a (R–134a)

### [14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]

### TABLE F–14

| NO. | TYPE | INITIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS–SECTIONAL AREA | | TENSILE | | % ELONGATION | TENSILE | | % ELONG. | TENSILE | % ELONG. |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | | lbm/in^2 | kg/mm^2 | | | |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 14404 | 10.13 | 18.90 | 25.37 | –51.90 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 9380 | 6.59 | 30.71 | –3.83 | 35.89 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 10252 | 7.21 | 7.48 | 18.98 | 15.85 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6483 | 4.56 | 123.23 | –12.53 | 16.92 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 5091 | 3.58 | 138.19 | –5.54 | –62.93 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 14128 | 9.93 | 17.72 | 11.00 | –74.75 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 6994 | 4.92 | 9.06 | –66.20 | –27.44 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 24519 | 17.24 | 11.02 | 15.32 | 7.69 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 3698 | 2.60 | 284.25 | –4.65 | 8.21 |
| 13 | POLYAMIDE–IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 15384 | 10.82 | 12.60 | –34.56 | –26.61 |
| 14 | POLYAMIDE–IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 22081 | 15.52 | 20.08 | –3.95 | –0.39 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16375 | 11.51 | 54.33 | 3.97 | –15.54 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 14863 | 10.45 | 25.98 | 5.55 | –43.97 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16224 | 11.41 | 66.93 | 8.55 | 7.46 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | N/A | N/A | N/A | N/A | N/A |
| 19 | POLYIMIDE–DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 11051 | 7.77 | 21.26 | 1.72 | –6.41 |
| 20 | POLYIMIDE–DF–ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 12524 | 8.81 | 17.72 | 2.58 | –1.53 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 15552 | 10.93 | 80.71 | 8.30 | 7.56 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14414 | 10.13 | 11.42 | 15.42 | 10.27 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 11273 | 7.93 | 41.34 | 11.69 | –49.15 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG ALKYLBENZENE AND HCFC-142b (142b)
### [14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]
### TABLE F-15

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS-SECTIONAL AREA | | TENSILE | | % ELONGATION | TENSILE | | % ELONG. | TENSILE | % ELONG. |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | | lbm/in^2 | kg/mm^2 | | | |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 15164 | 10.66 | 15.75 | 31.99 | -59.92 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 7992 | 5.62 | 24.21 | -18.06 | 7.14 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 8497 | 5.97 | 3.94 | -1.39 | -39.02 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6371 | 4.48 | 87.40 | -14.04 | -17.07 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 4669 | 3.28 | 386.22 | -13.48 | 3.61 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 25600 | 18.00 | 38.78 | 101.13 | -44.73 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.83 | 13952 | 9.81 | 6.10 | -32.56 | -51.10 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 24547 | 17.26 | 8.66 | 15.45 | -15.38 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 3833 | 2.70 | 256.02 | -1.17 | -2.53 |
| 13 | POLYAMIDE-IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 20485 | 14.40 | 15.75 | -12.86 | -8.26 |
| 14 | POLYAMIDE-IMIDE | 0.017 | 10.77 | 22990 | 16.16 | 20.16 | 23518 | 16.53 | 19.29 | 2.30 | -4.30 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16740 | 11.77 | 56.50 | 6.28 | -12.18 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 15347 | 11.70 | 30.79 | 18.13 | -33.62 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16636 | 11.70 | 43.11 | 11.31 | -30.78 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 3211 | 2.26 | 4.72 | -55.65 | -97.09 |
| 19 | POLYIMIDE-DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 10766 | 7.57 | 16.14 | -0.91 | -28.94 |
| 20 | POLYIMIDE-DF-ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 10780 | 7.58 | 12.80 | -11.70 | -28.88 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 15004 | 10.55 | 40.75 | 4.49 | -45.70 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14814 | 10.42 | 9.25 | 18.62 | -10.65 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 12429 | 8.74 | 32.48 | 23.15 | -60.05 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG BRANCHED ACID POLYOL ESTER AND HFC-143a (R-143a)

[14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275-300 PSIA]

TABLE F-16

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS-SECTIONAL AREA | | TENSILE | | | TENSILE | | | | |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | % ELONGATION | lbm/in^2 | kg/mm^2 | % ELONG. | TENSILE | % ELONG. |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 14882 | 10.46 | 14.76 | 29.53 | -62.42 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 8227 | 5.78 | 16.93 | -15.65 | -25.09 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 10356 | 7.28 | 4.72 | 20.18 | -26.83 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 6753 | 4.75 | 141.34 | -8.89 | 34.11 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 4811 | 3.38 | 317.52 | -10.86 | -14.82 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 14490 | 10.19 | 60.24 | 13.84 | -14.14 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 16181 | 11.38 | 9.06 | -21.79 | -27.44 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 24749 | 17.40 | 9.65 | 16.40 | -5.77 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 3856 | 2.71 | 227.36 | -0.58 | -13.44 |
| 13 | POLYAMIDE-IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 22737 | 15.99 | 13.98 | -3.29 | -18.58 |
| 14 | POLYAMIDE-IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 21570 | 15.17 | 19.49 | -6.17 | -3.32 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16666 | 11.72 | 37.20 | 5.81 | -42.17 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 15042 | 10.58 | 36.54 | 6.81 | -21.22 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16256 | 11.43 | 54.92 | 8.77 | -11.82 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 182.40 | 8072 | 5.68 | 12.60 | 11.49 | -92.24 |
| 19 | POLYIMIDE-DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 10563 | 7.43 | 17.32 | -2.78 | -23.74 |
| 20 | POLYIMIDE-DF-ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 12109 | 8.51 | 15.75 | -0.81 | -12.47 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 14932 | 10.50 | 72.64 | 3.98 | -3.20 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14469 | 10.17 | 9.84 | 15.86 | -4.94 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 12268 | 8.63 | 34.06 | 21.55 | -58.11 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

## TENSILE PROPERTIES OF PLASTICS EXPOSED TO 32 ISO VG ALKYLBENZENE AND HFC–152a (R–152a)
## [14 DAYS AT 150 DEG.C. (300 DEG.F.) AT 275–300 PSIA]
## TABLE F–17

| NO. | TYPE | INTIAL TESTING | | | | | AFTER AGING TESTING | | | % CHANGE AFTER AGING | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CROSS–SECTIONAL AREA | | TENSILE | | | TENSILE | | | | |
| | | in^2 | mm^2 | lbm/in^2 | kg/mm^2 | % ELONGATION | lbm/in^2 | kg/mm^2 | % ELONG. | TENSILE | % ELONG. |
| 1 | POLYPHTHALAMIDE | 0.017 | 10.65 | 11489 | 8.08 | 39.29 | 14199 | 9.98 | 12.99 | 23.59 | –66.93 |
| 3 | ACETAL | 0.016 | 10.57 | 9754 | 6.86 | 22.60 | 2965 | 2.08 | 7.09 | –69.60 | –68.64 |
| 4 | PHENOLIC | 0.017 | 10.76 | 8617 | 6.06 | 6.46 | 10275 | 7.22 | 4.72 | 19.24 | –26.83 |
| 5 | POLYVINYLIDENE FLUORIDE | 0.016 | 10.30 | 7412 | 5.21 | 105.39 | 7102 | 4.99 | 117.32 | –4.18 | 11.32 |
| 8 | POLYPROPYLENE | 0.016 | 10.62 | 5397 | 3.79 | 372.76 | 4567 | 3.21 | 312.60 | –15.38 | –16.14 |
| 9 | POLYARYL SULFONE | 0.017 | 10.77 | 12728 | 8.95 | 70.16 | 14299 | 10.05 | 39.17 | 12.34 | –44.16 |
| 10 | POLYETHYLENE TEREPHTHALATE | 0.017 | 10.85 | 20689 | 14.55 | 12.48 | 13800 | 9.70 | 8.07 | –33.30 | –35.33 |
| 11 | POLYPHENYLENESULFIDE | 0.017 | 10.76 | 21262 | 14.95 | 10.24 | 24569 | 17.27 | 9.25 | 15.55 | –9.62 |
| 12 | POLYTETRAFLUOROETHYLENE | 0.013 | 8.63 | 3879 | 2.73 | 262.68 | 4090 | 2.88 | 299.61 | 5.46 | 14.06 |
| 13 | POLYAMIDE–IMIDE | 0.017 | 10.69 | 23510 | 16.53 | 17.17 | 14187 | 9.97 | 19.49 | –39.66 | 13.53 |
| 14 | POLYAMIDE–IMIDE | 0.017 | 10.67 | 22990 | 16.16 | 20.16 | 22537 | 15.84 | 18.70 | –1.97 | –7.23 |
| 15 | POLYETHERIMIDE | 0.017 | 10.73 | 15750 | 11.07 | 64.33 | 16622 | 11.69 | 48.62 | 5.54 | –24.42 |
| 16 | MODIFIED POLYETHERIMIDE | 0.016 | 10.57 | 14082 | 9.90 | 46.38 | 15085 | 10.61 | 47.64 | 7.13 | 2.72 |
| 17 | POLYARYLETHERKETONE | 0.016 | 10.63 | 14946 | 10.51 | 62.28 | 16458 | 11.57 | 41.34 | 10.12 | –33.63 |
| 18 | POLYBUTYLENE TEREPHTHALATE | 0.017 | 10.95 | 7240 | 5.09 | 162.40 | 4994 | 3.51 | 5.51 | –31.02 | –96.61 |
| 19 | POLYIMIDE–DF | 0.023 | 14.76 | 10865 | 7.64 | 22.72 | 11407 | 8.02 | 18.50 | 4.99 | –18.54 |
| 20 | POLYIMIDE–DF–ISO | 0.022 | 14.42 | 12209 | 8.58 | 17.99 | 12391 | 8.71 | 15.75 | 1.49 | –12.47 |
| 21 | POLY(ARYLETHERETHERKETONE) | 0.017 | 10.90 | 14360 | 10.10 | 75.04 | 14898 | 10.47 | 65.55 | 3.75 | –12.64 |
| 22 | LIQUID CRYSTAL POLYMER | 0.017 | 10.69 | 12488 | 8.78 | 10.35 | 14251 | 10.02 | 9.06 | 14.12 | –12.55 |
| 23 | 66 NYLON, POLYAMIDE | 0.016 | 10.64 | 10093 | 7.10 | 81.30 | 12238 | 8.60 | 47.64 | 21.26 | –41.40 |

ALL CALCULATIONS BASED ON AN AVERAGE OF TWO TENSILE TESTS. EXCEPT NO.16 WHICH IS 5.
ALL TENSILE PULLS WERE AT AMBIENT CONDITION AND WITHIN 24HRS AFTER AGING CONDITIONS.
N/A = TEST BAR DESTROYED BY CONDITIONS.

# END

# DATE FILMED

3 / 10 / 93