December 4, 2018

Fresenius Kabi USA, LLC
Kim Forch
Regulatory Affairs Manager
Three Corporate Drive
Lake Zurich, IL  60047

Re:   K180615
      Trade/Device Name:  AMICUS Separator System
      Regulatory Class: Unclassified
      Product Code: LKN, GKT
      Dated:  November 2, 2018
      Received:  November 5, 2018

Dear Kim Forch:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. Although this letter refers to your product as a device, please be aware that some cleared products may instead be combination products. The 510(k) Premarket Notification Database located at https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmm/pmn.cfm identifies combination product submissions. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies.
You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Part 801); medical device reporting (reporting of medical device-related adverse events) (21 CFR 803) for devices or postmarketing safety reporting (21 CFR 4, Subpart B) for combination products (see https://www.fda.gov/CombinationProducts/GuidanceRegulatoryInformation/ucm597488.htm); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820) for devices or current good manufacturing practices (21 CFR 4, Subpart A) for combination products; and, if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/) and CDRH Learn (http://www.fda.gov/Training/CDRHLearn). Additionally, you may contact the Division of Industry and Consumer Education (DICE) to ask a question about a specific regulatory topic. See the DICE website (http://www.fda.gov/DICE) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

Gema Gonzalez -S

for
Benjamin R. Fisher, Ph.D.
Director
Division of Reproductive, Gastro-Renal, and Urological Devices
Office of Device Evaluation
Center for Devices and Radiological Health

Enclosure
Indications for Use

Depending on the AMICUS Separator System disposable used in the therapeutic apheresis procedure, the AMICUS Separator System has been cleared for the following:

The AMICUS Separator System is an automated blood cell separator indicated to perform therapeutic plasma exchange (TPE). (K111702)

The AMICUS Exchange Kit is indicated for use in Therapeutic Plasma Exchange (TPE). The kit is for use with the AMICUS separator. (K111702)

The AMICUS Separator System is an automated blood component separator indicated to perform red blood cell exchange (RBCX), including Exchange and Depletion/Exchange procedures, for the transfusion management of sickle cell disease in adults and children. (K180615)

The AMICUS Exchange Kit - Therapeutics is indicated for use in Therapeutic Plasma Exchange (TPE) and Red Blood Cell Exchange (RBCX). The kit is for use with the AMICUS separator. (K111702, K180615)

The Waste Transfer Set is indicated for use in Red Blood Cell Exchange (RBCX). The set is for use with the AMICUS separator. (K180615)

The Blood Component Filter Set with Vented Spike and Luer Adapter is indicated for the administration of blood and blood components during a Therapeutic Plasma Exchange (TPE) or Red Blood Cell Exchange (RBCX) therapeutic apheresis procedure. The set is for use with the AMICUS separator. (K111702, K180615)

Type of Use (Select one or both, as applicable)

- [ ] Prescription Use (Part 21 CFR 801 Subpart D)
- [ ] Over-The-Counter Use (21 CFR 801 Subpart C)

*DO NOT SEND YOUR COMPLETED FORM TO THE PRA STAFF EMAIL ADDRESS BELOW.*

This section applies only to requirements of the Paperwork Reduction Act of 1995.

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB number.
510(k) SUMMARY

Date Prepared:
December 3, 2018

Owner/Operator:
Fresenius Kabi AG
Bad Homburg, GERMANY 61346
Owner/Operator Number: 9027285

Contact Person:
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Manager, Regulatory Affairs
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847-550-2960
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Device Trade Name:
AMICUS Separator System

Common Name/Usual Name:
Automated Separator, Blood Cell and Plasma, Therapeutic
Automated Blood Cell Separator (Centrifugal Separation Principle)

Classification Name:
Automated separators, used for separation of blood cells and plasma for therapeutic purposes, have not been classified under a regulation by the Center for Devices and Radiological Health due to pre-amendment status.

21 CFR 864.9245 Automated Blood Cell Separator
Automated blood cell separators which are based on centrifugation type technology have been classified by the Center for Biologics Evaluation and Research as Class II devices with Special Controls (Docket 2005N-0017, Final Rule, 30-Nov-07, updated March 28, 2011 OMB Control No: 0910-0594).

Product Code and Classification Panel:
LKN (Gastroenterology/Urology panel) - Unclassified (due to pre-amendment status)
GKT (Hematology panel) - Separator, Automated, Apheresis
**Legally Marketed Device Under Which Substantial Equivalence is Being Claimed:**

**Predicate Device:** The predicate device for the AMICUS Separator System for use in RBCX is listed in the following table.

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Terumo BCT Spectra Optia Apheresis System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Number:</td>
<td>Product Code(s): 61000 (instrument), 10220 (set)</td>
</tr>
</tbody>
</table>
| 510(k) Holder:                                  | Owner/Operator Number: 9002708  
TERUMO BCT, INC.  
10811 West Collins Ave.  
Lakewood, CO 80215                         |
| 510(k) Number and Clearance Date               | K132429, December 6, 2013  
Clearance for Red Blood Cell Exchange          |

**Reference Devices:** The reference device(s) applicable to each component of the AMICUS Separator RBCX System along with a brief comparison is provided in the following table.

<table>
<thead>
<tr>
<th>RBCX Component</th>
<th>Reference Device(s)</th>
<th>Comparison to Reference Device</th>
</tr>
</thead>
</table>
| AMICUS Separator (hardware instrument) 4R4580, 4R4580R, 4R4580TH, 6R4580 | Terumo BCT COBE Spectra Apheresis System 71000 - cleared for use in apheresis procedures for either collections or therapeutic applications involving donors or patients | Same technological characteristics including centrifuge system, fluid control system, safety management system and anticoagulant management system.  
During product development of the AMICUS RBCX system, several internal *in vitro* studies using bagged blood were conducted. These studies concurrently collected data on the COBE Spectra Apheresis System for comparison. Overall study results showed that both devices are capable of meeting performance targets. |
<p>| AMICUS Separator 4R4580, 4R4580R, 4R4580TH, 6R4580 | AMICUS Separator 4R4580, 4R4580R, 4R4580TH, 6R4580 - cleared for use in TPE        | Identical except for software which has been updated for RBCX                                     |
| AMICUS Exchange Kit – Therapeutics X6R2349     | COBE Spectra RBCX Set 70700 - cleared for use with COBE Spectra Apheresis System     | Both are single use, dual access, sterile and non-pyrogenic fluid path disposable devices with similar components/materials made of PVC and non-PVC plastics that include tubing, containers, macro-aggregate filters, spikes, air traps, luer connectors, solution, inlet, return and replacement fluid lines |
| AMICUS Exchange Kit X6R2339                   | AMICUS Exchange Kit X6R2339 - cleared for use with AMICUS Separator System in TPE   | Identical                                                                                         |
| Waste Transfer Set X6C2172                    | AMICUS Exchange Kit X6R2339 - cleared for use with AMICUS Separator System in TPE   | Components/materials are the same as used on Exchange Kit; some dimensions are different             |</p>
<table>
<thead>
<tr>
<th>RBCX Component</th>
<th>Reference Device(s)</th>
<th>Comparison to Reference Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Component Filter Set with Vented Spike and Luer Adapter X6C2170</td>
<td>Blood Component Filter Set with Vented Spike and Luer Adapter X6C2170 - cleared for administration of blood and blood components during an AMICUS TPE procedure</td>
<td>Identical</td>
</tr>
<tr>
<td>Blood Component Recipient Set with Standard Blood Filter and Luer Adapter 4C2160</td>
<td>Blood Component Recipient Set with Standard Blood Filter and Luer Adapter 4C2160 - cleared for administration of blood and blood by-products during manual infusion</td>
<td>Macro-aggregate filter and filter housing are identical</td>
</tr>
<tr>
<td>COBE Spectra RBCX Set 70700 - cleared for use with COBE Spectra Apheresis System</td>
<td>COBE Spectra RBCX Set 70700 - cleared for use with COBE Spectra Apheresis System</td>
<td>Both are single use, sterile and non-pyrogenic fluid path disposable devices with similar components/materials made of PVC and non-PVC plastics that include tubing, macro-aggregate filters, spikes and luer connectors</td>
</tr>
</tbody>
</table>

**Device Description:**
The AMICUS Separator System is comprised of the AMICUS separator instrument and a disposable apheresis kit specific to the procedure being performed. The instrument is a continuous-flow, centrifugal device that draws whole blood from a donor/patient, separates the blood into its components, collects one or more of the blood components, and returns the remainder of the blood components to the donor/patient. The instrument operates using pumps, clamps and valves that move donor/patient blood through a single-use, sterile fluid path disposable kit. The cells are centrifugally separated within the kit by density differences.

The operator is responsible for connecting and monitoring the donor/patient and operating and monitoring the AMICUS separator during the procedure. The operator controls the separator through a touch screen. When necessary, the operator is warned of problems with messages on the screen and corresponding audible alarms.

Once the cell separation is complete, the operator disconnects the donor/patient, dismantles the kit, and disposes of the kit in a safe manner. The kit is packaged in a recyclable plastic tray.

**Modification to the Existing Device:**
The physical design of the AMICUS instrument is identical to the marketed device. The only changes being made to the AMICUS separator in support of this submission is the use of Software Version 5.1 to perform Red Blood Cell Exchange (RBCX) procedures, the revision of Volume 1 (Operation Basics) of the operator’s manual to expand the intended use/indications for use to include RBCX procedures, and the addition of Volume 5 (RBCX) to the operator’s manual.

The AMICUS software was modified for RBCX to include algorithms to adjust the pumps to achieve the target FCR (Fraction of Cells Remaining) and/or target end hematocrit while providing an accurate fluid exchange. The combination of weight scales and mechanical pumps is used to accurately track the RBCs removed and to monitor the volume of replacement fluid returned. The software was also modified to include the necessary input parameters and function buttons for the operator to perform the RBCX procedures, along with the appropriate note alarms and text strings.

The exchange kit used in the RBCX procedures is the same disposable cleared for use in the AMICUS TPE procedure (K111702, 03/22/12). There are no changes to the physical design, components, fluid path
materials, storage conditions or manufacturing methods. The product cleared in K111702 is named the “AMICUS Exchange Kit” (product code R4R2339). However, with the addition of the RBCX indication to the labeling (subject of this submission), a new product code (X6R2349) with a different product name of “AMICUS Exchange Kit - Therapeutics” has been created. The only difference between the two kits is in the product code/name and indications listed on the labeling, as the new X6R2349 code is being updated to include the RBCX indication (in addition to TPE).

A new ancillary waste transfer set (product code X6C2172) was developed (with appropriate labeling) for use with the exchange kit in RBCX procedures to allow for transfer of removed RBCs from the smaller waste container on the front right scale hook to the two larger waste containers on the side panel of the instrument. As such, the set will not contact the patient fluid path since waste material is not returned. The components and materials on the transfer set are the same as used on the cleared exchange kit.

Statement of Intended Use:
The AMICUS Separator System is an automated blood cell separator intended for use in therapeutic apheresis applications and may be used to perform Therapeutic Plasma Exchange (TPE).

The AMICUS Separator System is an automated blood component separator intended for use in therapeutic apheresis applications and may be used to perform Red Blood Cell Exchange, Depletion, and Depletion/Exchange (RBCX) procedures.

The AMICUS Separator System is an automated blood cell separator intended for use in the collection of blood components and mononuclear cells.

Indications for Use:
Depending on the AMICUS Separator System disposable used in the therapeutic apheresis procedure, the AMICUS Separator System has been cleared for the following:

The AMICUS Separator System is an automated blood cell separator indicated to perform Therapeutic Plasma Exchange (TPE). (K111702)

The AMICUS Exchange Kit is indicated for use in Therapeutic Plasma Exchange (TPE). The kit is for use with the AMICUS separator. (K111702)

The AMICUS Separator System is an automated blood component separator indicated to perform Red Blood Cell Exchange (RBCX), including Exchange and Depletion/Exchange procedures, for the transfusion management of Sickle Cell Disease in adults and children. (K180615)

The AMICUS Exchange Kit - Therapeutics is indicated for use in Therapeutic Plasma Exchange (TPE) and Red Blood Cell Exchange (RBCX). The kit is for use with the AMICUS separator. (K111702, K180615)

The Waste Transfer Set is indicated for use in Red Blood Cell Exchange (RBCX). The set is for use with the AMICUS separator. (K180615)

The Blood Component Filter Set with Vented Spike and Luer Adapter is indicated for the administration of blood and blood components during a Therapeutic Plasma Exchange (TPE) or Red Blood Cell Exchange (RBCX) therapeutic apheresis procedure. The set is for use with the AMICUS separator. (K111702, K180615)
**Technological Comparison as Compared to the Predicate Device**

The technological characteristics of the AMICUS Separator System for use in Red Blood Cell Exchange are substantially equivalent to the Spectra Optia Apheresis System for use in Red Blood Cell Exchange. This includes the centrifuge system, fluid control system, safety management system (including safety sensors and alarms) and anticoagulant management system which determines the anticoagulation level in the system and the rate at which citrate can be returned to the patient. The physical design of the AMICUS instrument includes three main areas of operation (touch screen, top panel and centrifuge) that are substantially equivalent to those on the Spectra Optia device.

The disposable device design requirements for the AMICUS Exchange Kit – Therapeutics X6R2349, Waste Transfer Set X6C2172 and Blood Component Filter Set with Vented Spike and Luer Adapter X6C2170 are similar to those for the Spectra Optia Exchange Set 10220. The disposables are manufactured from PVC and non-PVC plastics and are designed to be single use, sterile and non-pyrogenic fluid path devices that include tubing, macro-aggregate filters, spikes, luer connectors, and integrated containers (X6R2349 and 10220) that hold waste materials during the procedures. Additionally, the disposables are designed for use with anticoagulant and saline solutions and/or with red cell replacement fluids.

**Performance Data:**

During the development phase of the AMICUS RBCX operating protocol, several internal *in vitro* studies using bagged blood were completed to assess the performance and safety of RBCX procedures on the AMICUS Separator System. Results of the studies were in accordance with specifications.

System verification and validation activities have been conducted on the AMICUS Separator System for performance of RBCX procedures. Software changes were verified as part of a total system testing effort which follows the software development and testing methods described in international standards and FDA guidance documents. System verification and validation testing activities were conducted to demonstrate that the instrument, software and disposables operate together per specification and intended use. The disposable kit and sets for use in the AMICUS RBCX operating protocol have been tested in the clinical study and in performance bench testing to support a substantial equivalence decision. This includes adequate biocompatibility, functional and engineering performance testing. Sterility integrity testing has also been completed and real time aging data continues to be collected.

Clinical testing completed on the AMICUS Separator System showed that AMICUS can be used to safely and effectively perform RBCX procedures in patients. The testing is described below.

**AMIC-003-CMD: Evaluation of the AMICUS Red Blood Cell Exchange (RBCX) System in Sickle Cell Patients:**

The AMIC-003-CMD clinical study was a single-arm, open label study conducted at multiple investigational sites to evaluate the RBC Exchange and RBC Depletion/Exchange procedures in subjects with sickle cell disease. The primary objective of the study was to evaluate the accuracy of the subject’s original RBCs remaining (Actual FCR) as measured by subject’s post-procedure Hb S at the end of the procedure to the Target FCR. The pre-defined target range for the Actual to Target (A:T) FCR ratio was 0.75 to 1.25 for a 95% confidence interval (CI). Subjects completed a single RBC Exchange or RBC Depletion/Exchange procedure as prescribed by the physician. This study allowed enrollment of subjects 6 years of age and older. Fifty-nine (59) evaluable procedures were completed.
**Results:** The primary endpoint was achieved with a mean ± SD calculated A:T FCR ratio of 0.978 (0.1933) with a 95% CI of 0.927 to 1.028, within the specified range. The mean ± SD calculated target End Hct Accuracy was 1.19 (0.817) %. Changes observed for the subject cellular losses (WBC and platelet counts) from pre- to post-procedure were not clinically significant. All of the adverse events were consistent with events anticipated in the context of RBCX procedures and in the sickle cell disease patient population. No adverse device effects (ADEs) or unanticipated adverse device effects (UADEs) were reported. The RBC Exchange and RBC Depletion/Exchange procedures were accurately and safely completed in subjects using the AMICUS RBCX System.

**AMC-004-CMD: Evaluation of the AMICUS Red Blood Cell Exchange (RBCx) System:**
The AMIC-004-CMD clinical study was conducted at a single investigational site to evaluate the AMICUS RBC Depletion procedure. The primary objective of the study was to evaluate the accuracy of the subject’s Hct post-procedure (Actual End Hct) to the Target End Hct. The pre-defined target range for the A:T End Hct ratio was 0.85 to 1.15 for a 95% confidence interval (CI). This single-arm, open label study enrolled subjects 18 years and older to complete a single RBC Depletion procedure as prescribed by the physician for their medical condition. Thirty-six (36) evaluable procedures were completed.

**Results:** The primary endpoint was satisfied with a mean ± SD calculated Actual to Target End Hct ratio of 1.0 ± 0.05 with a 95% CI of 0.95 to 0.98, indicating that the AMICUS RBCX system can accurately achieve the desired target End Hct for RBC Depletion procedures. Changes observed for the subject cellular losses (RBC, WBC, and platelet counts) from pre- to post-procedure were not clinically significant. Only two adverse events were reported; both were moderate, non-serious, and not related to the study device. The 95% CI (0.95, 0.98) demonstrates that the system is functioning as intended and the secondary objective evaluations of cellular loss acceptable. No adverse device effects (ADEs) or unanticipated adverse device effects (UADEs) were reported. The RBC Depletion procedures were accurately and safely completed in subjects using the AMICUS RBCX System.

**Conclusion:**
Based on the testing performed, the AMICUS Separator System when used for Red Blood Cell Exchange performs as intended in a safe and effective manner that is substantially equivalent to the Terumo BCT Spectra Optia Apheresis System for use in Red Blood Cell Exchange procedures in adults and children.