



# Approved Components List

Global Common

SD-007

ISSUED March 8, 2007

REVISED December 16, 2024

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## 1. Scope

The intent of this approved components list is to minimize the proliferation of components within Nexteer Automotive. Any deviation from this list shall be submitted in writing and written approval obtained from the appropriate Nexteer Automotive Engineer in Charge.

## RECORD OF REVISIONS

Revision	Date	Section	Description
001	08MR07	ALL	ORIGINAL APPROVAL & ISSUE DATE
002	31MY09	ALL	This release of SD-007-GC is global common and replaces SD-007, SD-007-NA and all SD-007-xxx global site preferred / approved components lists.
003	06NO09	ALL	Company name updated and "GC" removed from specification number. All SD documents are global common. Added SMC ISO valves, Festo 63 mm bore cylinders and Rockwell PanelView Plus Compact HMI's.
004	17DE10	ALL	General fluid power and electrical safety update
005	15OC12	ALL	General fluid power and electrical update.
006	06JN14	ALL	General fluid power and electrical update.
007	12OC15	ALL	General fluid power and electrical update.
008	10DE15	ALL	Fixed formatting issues and missing switch updates.
009	24FE17	ALL	General fluid power and electrical update.
010	28JN18	ALL	General fluid power and electrical update.
011	15NO19	ALL	Entire Specification update
012	24JA22	ALL	General fluid power and electrical update.
013	01DE23	ALL	General fluid power and electrical update.
014	16DE24	ALL	Significant updates to most sections with added component options and clarifications.
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## 2. Manufacturing Engineering - Major Mechanical Components

The "Component" column is organized by component type. Nexteer Automotive does not have requirements for technologies not listed.

The "Requirements" column has two functions:

- 1) Where component brand or part numbers are designated, this is the Nexteer Automotive approved (required) component.
  - Where multiple brands or part numbers are listed, OEM's are allowed to select the one that provides the best value. Components are not listed in any preferred order.
- 2) Where specifications are provided, components are required to meet these specifications.

NOTE: To identify regional requirements, the following notations are used: (B) - Brazil; (C) - China; (I) - India; (E) - Europe & Morocco; and (NA) - North America. If not specifically noted with region letter designation, any of the designated components may be used.

The "Examples" column lists components that meet the requirements listed in the "Requirements" column. The example components are not required.

NOTE: Changes since the last revision are highlighted

Component	Requirements	Examples
A. Brake, Electric	Midwest Reuland Warner	
B. Clutch / Brake		
1. Air	Posidyne Som-Pac Nexen / Horton (Requires single point lubrication)	
NOTE: Air is preferred over Electric.		
2. Electric	Warner Steams Dynatorque	
C. Driverless Vehicles	KUKA	
(AMR, AGV, AGIV, FMR)	Omron MIIR	
	NOTE: Additional driverless vehicle manufacturers shall have written approval from Core Controls & Automation prior to purchase.	
	NOTE: All autonomous Mobile Robots and Automated Guided Vehicles shall comply with the safety requirements and protective measures detailed in ISO 3691-4 or ANSI/ITSDF B56.5.	
D. Gear Reducers	Requirements based on Application	Bonfiglioli Ohio Bosch-Rexroth Siemens Boston SEW Eurodrive Lenze Sumitomo Drive Tech Morse Nord Drive systems Winsmith
E. Indexers	Camco-Ferguson Swanson Erie Weiss	
	NOTE: Shall use SD-007 approved VFD for control.	
F. Leak Testing Units	Refer To Manufacturing Equipment Purchase Specification or Purchasing Manufacturing Engineer	
	Cincinnati Test Systems Cosmo Sciometric	
G. Mist Collectors	3nine (NA) Royal Filterist	

Component	Requirements	Examples
H. Electric Presses  NOTE: Promess U.S.A Version shall be ordered when purchasing outside of the U.S.A.	Refer To Manufacturing Equipment Purchase Specification or Purchasing Manufacturing Engineer  Kistler Oacis Tox Promess U.S.A  NOTE: Promess UltraPro controllers require the use of a PULS Power Supply CT10.241 and PULS Buffer module UF20.241	
I. Industrial Robot Hardware  1. Actuator           2. Controller  NOTE: For Fanuc European Controllers it is preferred to purchase with Auto/T1 operator panel rather than installing the Retro Kit.	Selection of hardware below is application specific. Refer to SD-1040 for guidance  <u>Fanuc</u> Fanuc Mate Series Fanuc M Series & R Series Fanuc SCARA Series  <u>KUKA</u> KR Cybertech KR Agilus KR Iontec KR Quantec KR SCARA  <u>Fanuc</u> R-30iB Plus Mate R-30iB Plus A-Cabinet R-30iB Compact Plus  <u>KUKA</u> KR5 KR5 micro	
J. Industrial Robot Software  1. EIP Options a) Ethernet / IP Adapter Software  NOTE: Required on all applications.   b) Ethernet / IP Safety  NOTE: Required to support safety PLC applications.  2. Motion Options        3. Safety Rated Soft Axis Option     4. Karel	Software options below are all required unless specified.  <u>Fanuc</u> R784 Ethernet / IP Adapter R860 Advanced EIP (Includes R784 Ethernet / IP Adapter)  <u>KUKA</u> KUKA EtherNet/IP M/S (Includes safety PLC support)  <u>Fanuc</u> R713 Ethernet / IP Safety  <u>Fanuc</u> R809 Motion Package (NA) J684 Collision Guard Pack (B) (C) (I) (E) R663 Constant Path (B) (C) (I) (E) R806 ADV-CP Path Control (B) (C) (I) (E) R805 ADV-CP Speed Control (B) (C) (I) (E) R792 Singularity Avoidance (B) (C) (I) (E) R583 Motion Interface (B) (C) (I) (E)  <u>KUKA</u> All motion options included within the base software.  <u>Fanuc</u> J567 DCS Position & Speed Check R764 4D Graphics R859 Advanced DCS Package (Includes both J567 and R764 software packages)  <u>KUKA</u> KUKA.SafeOperation  <u>Fanuc</u> R632 Karel	
K. Industrial Robot Vision (Guidance) 1. 2D Applications   2. 3D Applications   3. Random Bin Picking	iRVision Cognex Keyence  Keyence RB Series Fanuc 3DV Series SICK  Keyence RB Series	

Component	Requirements	Examples
L. Screwdrivers	Refer To Manufacturing Equipment Purchase Specification or Purchasing Manufacturing Engineer  Atlas Copco Stanley Webber	
M. Shaft Overload 1. Not Timed	Dodge Morse	
2. Timed	Ferguson Standard Tool	
N. Variable Ratio Pulleys  NOTE: All pulleys and sprockets to be attached with a taper lock or equivalent device	Reeves Woods	

## 3. Manufacturing Engineering - Process and Test Engineering

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Component	Requirements	Examples
<b>A. Data Acquisition Cards</b>  NOTE: Submit proposed choice to Manufacturing Test Engineer for Approval.	Pxle-1073 Chassis w/ Integrated Mxle Controller (High density, scalable, high speed simultaneous sampling +500KS/s) Pcle Controller Card 5 Peripheral Slot 1 Port PCIe, 3m Cable  USB-6002 USB-6003 (High speed sampling) USB-6356 (High speed simultaneous sampling) USB-6341 USB-4065 (multifunction measure DAQ, requires 1A instrumental fuse)	National Instruments X Series DAQ cards (USB bus)
1. I/O Connector Block	SCB-68A (w/ Cable SHC68-68-RMIO) SCB-68 HSDIO (w/ Cable SHC68-C68-RDIO2)	
2. FPGA (Field Programmable Gate Array)	USB-7846R (R-Series Multifunction RIO w/ Kintex-7 160T) USB-7856R (R-Series Multifunction RIO w/ Kintex-7 160T)	
<b>B. DC Power Supply</b> 1. Low Power (0 - 10A)	Ripple - 3mV Max Input AC Selectable Must be mounted in Cabinet	Sola HD SilverLine
2. Medium Power (10-50A)	Ripple - 150mV Max Input AC 85-265V Must be mounted in Cabinet	TDK SWS 500L-12
3. High Power (+50A) - Programmable DC	Ripple - 150mV Max Input AC Configurable Protect from external Contaminants	Sorensen DCS 20-15E w/ M130 ethernet option Ametek Asterion AST4-125AR Delta Elektronika SM-66-AR-110 TDK Lambda GEN-20-250-3P480
<b>C. Motion Control</b>	Allen-Bradley Kinetix 5500 2198-H0** -ERS 2198-H2DCK, Feedback Converter Kit for MPL Motors NOTE: Refer to section 7.D.1 for complete requirements NOTE: Allowed on PLC Controlled Test Equipment only.  Kinetix 5100 2198-E**** -ERS NOTE: Allowed on LabVIEW Controlled Test Equipment only.  Nidec Nidec M600 NOTE: Allowed for Speed Control on Test Equipment only. NOTE: Allowed only on Retool LabVIEW based Test Equipment already using Momentum IO modules.  Nidec M700 NOTE: Allowed on Test Equipment only.	

Component	Requirements	Examples
D. I/O Modules	<p>Phoenix AXL F BK ETH - Axioline Communication Module AXL F DI16/1 DO16/1 2H (24Vdc - 16DI &amp; 16DO expansion-Module)</p> <p>MOXA ioTinkx 4510 Modbus Adapter Communication Module ioTinkx 45MR-1600 (16-In Expansion Module) ioTinkx 45MR-2600 (16-Out Expansion Module)</p> <p>Murrelektronik Cube20 BN-E/IP DI8 Art. No. 56005 Communication Module DI16/DO16 - (E) Art. No. 56168, 16 In, 16 Out Expansion Module</p> <p>NOTE: Allowed on LabVIEW base Test Equipment only</p> <p>Schneider Electric - Momentum 170 ENT 11001 (Ethernet w/ built-in Web Server) 170 ADM 350 10 (24Vdc, 160DI &amp; 16DO I/O Module) 170 ADM 350 10 (24Vdc, 160DI &amp; 16DO I/O Module)</p> <p>NOTE: Allowed only on Retool LabVIEW based Test Equipment already using Momentum IO modules.</p>	
E. Signal Conditioning	<p>Built in Power Supply Adjustable gain/offset for coarse and fine Analog Output 0-10V IP 54 minimum for protective case Built in output Anti-aliasing filter (preferable)</p>	<p>Interface SGA (AC/DC Powered Signal Conditioner)</p>
F. Transducers		
1. Current	<p>Closed Loop Hall Effect CE</p>	<p>LEM LA-205 LEM LTS 6-NP</p>
2. Load Cell	<p>0.05% FSA Maximum Tension / Compression Style Minimum +/-150% FS Overload CE</p>	<p>Lebow 3140-P Series</p> <p>Interface Series 1100 Ultra Precision Lowprofile ©</p> <p>Honeywell 314-CS Models 0.02/0.04% FSA</p> <p>Futek LCB450 (5000lb)</p>
3. Piezo - Electric	<p>Kistler 914XB Series PCB 2X1B PCB 260Axx Amplifier Kistler 5073Axxx Amplifier Kistler 5015Axxx Amplifier/DAQ National Instruments USB-4432 Amplifier PCB 482CXX CE</p>	<p>Kistler, PCB Piezotronics (contact ME in charge for model selection)</p>
4. Position (LVDT)	<p>IP67 (IP67G+ for applications with oil) CE</p>	<p>Keyence GT2 Series MTS - Temposonics</p>
5. Torque (Non-Rotary)	<p>0.1% FSA Maximum 4.0E+03 Spring Rate (Nm/rad) Minimum IP40 Minimum CE</p>	<p>Interface Model 5355 Solid Flange Reaction Torque Transducer</p> <p>Honeywell 2012 Flange Reaction Torque Sensor</p> <p>Lorenze DF-30 Flange Reaction Torque Sensor</p>
6. Torque (Rotary)	<p>24Vdc Input 0-10Vdc output 0.1% FSA Maximum 10KHz Sampling Rate Minimum 4.0E+03 Spring Rate (Nm/rad) Minimum IP40 Minimum CE</p>	<p>Interface T25 Series: 10Nm Range 10V analog output option (Applications torque measured 4nm &amp; 100RPM Max)</p> <p>Interface T25 Series: 20Nm Range 10V analog output option</p>

Component	Requirements	Examples
		Interface T25 Series: 200Nm Range 10V analog output option (Applications torque measured 50Nm Minimum) Lorenz Equivalent Model
G. Software Requirements 1. Test Equipment	National Instruments LabVIEW 2017 or newer Professional Development Software	
2. CNC	Fanuc Fanuc Ladder -III	



#### 4. Machine Pneumatic Components

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NOTE: All threaded pressurized fittings shall be BSPP (G) thread except for the main air drop which is NPT. BSPT (R) threads are not permitted except for use on mufflers.

NOTE: Changes since the last revision are highlighted

Component	Requirements	Examples
A. Accessories		
1. Thread Sealants	RTV, Teflon tape, and horsehair sealants shall NOT be used. NOTE: BSPP fittings with face seals do not require thread sealant.	
a) NPT, BSPT (R) Pipe Connections	<u>Loctite</u> 567 PST General Purpose 2087067 (50 ml) 2087069 (250 ml) NOTE: White, anaerobic, 400F, NPT/BSPT tapered threads	
b) BSPP (G) Pipe Connections	<u>Loctite</u> 577 PST General Purpose 2068749 (50 ml) 2068748 (250 ml) NOTE: Yellow, anaerobic, 300F, straight threads	
2. Surge Tanks	ASME BPVC Rules for Construction of Pressure Vessels - Section VIII-Division 1-(2023) (NA)	
3. Vacuum Devices	All others regions shall meet: - Pressure Equipment Directive (PED) 2014/68/EU - Simple Pressure Vessels Directive (SPVD) 2014/29/EU - Unfired Pressure Vessels EN/13445	
a) Air-Operated	<u>Festo</u> VN OVEM NOTE: With blow off, with or without display.  <u>SMC</u> ZH ZL112A-DBL ZL112A-DBL-Q ZM1*1H-*5LZ-E17	
4. Flow Meter		
a) Electronic		
1) Test	<u>Hastings</u> HFM Series	

Component	Requirements	Examples
2) General	<u>Hedland</u>  <u>SMC</u> PFM Series PF2A Series	
b) Differential Pressure	Meriam - Laminar Flow Element	
c) Rotameters	Fisher-Porter Brooks	
5. Gauge		
a) Pressure	Units of Pascal required for China	
1) General Purpose	3.0% Full Scale (FS) accuracy or better	
a) China	<u>Festo</u> MA-40-1.0-R1/8-MPA-E-RG (C)      1 MPa      1/8 BSPT      526778 MA-50-1.0-R1/4-MPA-E-RG (C)      1 MPa      1/4 BSPT      526781 MA-50-0.25-R1/4-MPA-E-RG (C)      0.25MPa      1/4 BSPT      526780  <u>SMC</u> G36-P10-01-X30 (C)      1 MPa / 145 PSI      1/8 BSPT      162835	
b) All Other Regions	PSI / Bar	<u>Festo</u> MA-40-10-1/8-EN      1/8 BSPT      162835 MA-50-10-1/4-EN      1/4 BSPT      162838  <u>SMC</u> G36-P10-01-X30      1/8 BSPT
2) Push-In for Sandwich Regulator	5.0% Full Scale (FS) accuracy or better	
a) China	<u>Festo</u> PAGN-26-1M-P10 (C)      1 MPa      563736 PAGN-40-1M-P10 (C)      1 MPa      563738	
b) All Other Regions	PSI / Bar	<u>Festo</u> PAGN-26-10-P10      543488 PAGN-40-10-P10      548009
3) Test	PSI / Bar 4.25" Diameter NPT 0.25% Full Scale (FS) accuracy or better NIST Traceability paperwork required	Helicoid Ashcroft
b) Gauge adapter	NOTE: 12 x 1.5 connection is required  <u>Schroeder</u> S1215DCNPT14      1/4 NPT	
c) Pressure tap, Test Port	NOTE: 12 x 1.5 connection is required  <u>Schroeder</u> S1215G14WDP      G1/4	
6. Muffler, Exhaust, Silencer	NPT models are for lockout valves only BSPT for all other applications Bronze or plastic sintered and paper elements are not allowed.	<u>Numatics</u> M1MB      1/8 BSPT M2MB      1/4 BSPT M3MB      3/8 BSPT M4MB      1/2 BSPT M5MB      3/4 BSPT M6MB      1 BSPT M5MN      3/4 NPT M6MN      1 NPT

Component	Requirements	Examples
7. Safety Rated Manual Blow Gun		<u>Alwitco</u> B18, 0554018 1/8 BSPT B28, 0554028 1/4 BSPT B38, 0554038 3/8 BSPT B48, 0554048 1/2 BSPT B68, 0554068 3/4 BSPT B88, 0554088 1 BSPT B68, 0154068 3/4 NPT B88, 0154088 1 NPT
	OSHA 1910.242(b)	<u>Exair</u> 1697-PEEK-12-CS  NOTE: For retrofitting an existing 1697, PEEK with a 12" extension and chip shield, use: 938812 (extension) 900453 (coupler 1/8") 901221 (chip shield)  <u>GUARDIAR, WHISPERJET</u> 80LJ012AA
B. Actuators	NOTE: Spring loaded cylinders require the Fluid Power Engineer's prior approval. NOTE: FK rod aligner required on guided applications	
1. Linear (with rod)	Double-acting only Cylinder rods shall have male threads NOTE: Asterisk (*) within Linear (with rod) section refers to required stroke length. Deviation requires approval from assigned Fluid Power Engineer.	
a) Compact	ISO 21287	
1) Single Rod	<u>Festo</u> ADN-25-*A-P-A 10, 15, 20, 25, 30, 40, 50, 60 M5 ADN-50-*A-P-A G1/8 ADN-63-*A-P-A 10, 15, 20, 25, 30, 40, 50, 60, 80 G1/8 ADN-100-*A-P-A G1/8  <u>SMC</u> CD55B25-*M M5 CD55B50-*M 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 80, 100, 125 G1/8 CD55B63-*M G1/8 CD55B100-*M G1/8	
2) Double Rod	<u>Festo</u> ADN-25-*A-P-A-S2 10, 15, 20, 25, 30, 40, 50, 60 M5 ADN-50-*A-P-A-S2 G1/8 ADN-63-*A-P-A-S2 10, 15, 20, 25, 30, 40, 50, 60, 80 G1/8 ADN-100-*A-P-A-S2 G1/8	
3) Single Rod - Non-Rotating	<u>Festo</u> ADNGF-50-*P-A G1/8 ADNGF-63-*P-A 10, 15, 20, 25, 30, 40, 50, 60, 80 G1/8 ADNGF-100-*P-A G1/8  <u>SMC</u> CDQMB50TF-* G1/4 CDQMB63TF-* 10, 15, 20, 25, 30, 35, 40, 45, 50, 75, 100 G1/4 CDQMB100TF-* G3/8	
4) Double Rod - Non-Rotating	<u>Festo</u> ADNGF-50-*P-A-S2 G1/8 ADNGF-63-*P-A-S2 10, 15, 20, 25, 30, 40, 50, 60, 80 G1/8 ADNGF-100-*P-A-S2 G1/8	

Component	Requirements	Examples
ISO 21287	<div>NOTE: Requires the Fluid Power Engineer's prior approval.</div> <div><div>Festo</div><div>High Force</div><div>ADNH-25-*A-P-A-*N</div><div>ADNH-40-*A-P-A-*N</div><div>ADNH-63-*A-P-A-*N</div><div>ADNH-100-*A-P-A-*N</div></div>	
b) 12-25mm Bore	ISO 6432	
1) Single Rod	<div><div>Festo</div><div><div>Stroke Lengths</div><div>DSNU-12-*P-A10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 100, 125M5</div><div>DSNU-25-*PPV-A10, 15, 20, 25, 30, 35, 40, 50, 60, 70, 80, 100G1/8</div></div></div> <div><div>SMC</div><div>CD85N12-*B10, 25, 40, 50, 80, 100, 125, 160, 200M5</div><div>CD85N25-*C-BG1/8</div></div>	
2) Double Rod	<div><div>Festo</div><div><div>Stroke Lengths</div><div>DSNU-12-*P-A-S210, 15, 20, 25, 30, 40, 50, 60, 70, 80, 100, 150M5</div><div>DSNU-25-*PPV-A-S210, 15, 20, 25, 30, 35, 40, 50, 60, 70, 80, 100, 125G1/8</div></div></div> <div><div>SMC</div><div>CD85WE12-*B10, 25, 40, 50, 80, 100, 125, 160, 200M5</div><div>CD85WE25-*C-B25, 40, 50, 80, 100, 125, 160, 200, 250, 300G1/8</div></div>	
c) 32-100mm Bore	ISO 15552	
	<div>NOTE: Linear with male rod end(s) Festo FNC, HNC, or SNBC mounting bracket required.</div> <div>NOTE: Male rod ends whenever possible.</div> <div>NOTE: Pneumatic cushioning on both ends.</div>	
1) Single Rod	<div><div>Festo</div><div><div>Stroke Lengths</div><div>DSBC-32-*PPVA-N3G1/8</div><div>DSBC-50-*PPVA-N3G1/4</div><div>DSBC-63-*PPVA-N320, 25, 30, 40, 50, 60, 70, 80, 100, 125, 150, 160, 200, 250, 300, 320, 400, 500G3/8</div><div>DSBC-80-*PPVA-N3G3/8</div><div>DSBC-100-*PPVA-N3G1/2</div></div></div> <div><div>SMC</div><div>CP96SDB32-*CG1/8</div><div>CP96SDB50-*CG1/4</div><div>CP96SDB63-*C25, 50, 80, 100, 125, 160, 200, 250, 320, 400, 500G3/8</div><div>CP96SDB80-*CG3/8</div><div>CP96SDB100-*CG1/2</div></div>	
2) Double Rod	<div><div>Festo</div><div><div>Stroke Lengths</div><div>DSBC-32-*T-PPVA-N3G1/8</div><div>DSBC-50-*T-PPVA-N3G1/4</div><div>DSBC-63-*T-PPVA-N320, 25, 30, 40, 50, 60, 70, 80, 100, 125, 150, 160, 200, 250, 300, 320, 400, 500G3/8</div><div>DSBC-80-*T-PPVA-N3G3/8</div><div>DSBC-100-*T-PPVA-N3G1/2</div></div></div> <div><div>SMC</div><div>CP96SDB32-*CWG1/8</div><div>CP96SDB50-*CWG1/4</div><div>CP96SDB63-*CW25, 50, 80, 100, 125, 160, 200, 250, 320, 400, 500G3/8</div><div>CP96SDB80-*CWG3/8</div><div>CP96SDB100-*CWG1/2</div></div>	

Component	Requirements	Examples
2. Linear (rodless)  a) 8-63mm Bore	<u>Festo</u> DGC-K-*-*PPV-A-GK-FK (External Guiding required) DGC-*-*KF-PPV-A DGC-*-*KF-YSRW-A-1H-PN NOTE: "1H-PN" clamping unit is only available for 25, 32, 40, and 50mm bore sizes. It is not rated for dynamic stopping (safety applications). Only allowed in non-safety related applications.  <u>SMC</u> MY1B**TF-***Z (External Guiding required) MY1HT*TF-*L (with recirculating ball bearing guide)	
b) Operator Door Applications	SD-1038 Magnetic breakaway, 30lbs or less. NOTE: Example part number below includes required floating bracket and foot mount kit.  <u>Tolomatic</u> 24100222 SK*.* FL FM2 *.* = Stroke length in inches	
3. Slides	<u>Festo</u> DFM-*-*P-A-KF (for strokes less than 200mm) FENG-*-*KF (with DSBC cylinder for strokes greater than 200mm) or DFM-*-*B-PPV-A-KF DGS*-*-*PA (high tolerance) DGST-*-*PA SLS-*-*PA  <u>SMC</u> MGPL*TF-*Z MXH*-*Z MXS*TF-*A CY1SG*TF-*Z (magnetically coupled) NOTE: CY1SG slide above requires the Fluid Power Engineer's prior approval.	
4. Brakes & Locks	Load Stopping and Holding = Brakes Load Holding = Locks NOTE: Refer to the Machine Risk Assessment when load stopping (brakes) are required. Load Stopping (brakes) are typically used for control of suspended vertical loads while load holding (locks) are generally used for process requirements.	
a) Cylinder Rod		
1) Brakes	<u>SMC</u> C96NDB*-*C NOTE: Use IFM bracket E11797 and IFM MK5101 T-Slot prox sensor.	
2) Locks	<u>SMC</u> C96NDB*-*C NOTE: Use IFM bracket E11797 and IFM MK5101 T-Slot prox sensor.	
b) Rail		
1) Brakes	<u>Zimmer Group</u> MBPS Series	
2) Locks	<u>Zimmer Group</u> MKS Series	
c) Shaft		
1) Brakes	<u>Zimmer Group</u> RBPS****-A	
2) Locks	<u>Zimmer Group</u> MKRS*****A	

Component	Requirements	Examples
5. Grippers	NOTE: Refer to the Machine Risk Assessment for gripper valve type and if a internal spring is required.	
a) 2 Jaw (Parallel)	<p><u>Festo</u> DHPS-*A DHPS-*A-NO (spring to open) DHPS-*A-NC (spring to close)</p> <p>HGPD-*A HGPD-*A-G1 (spring to open) HGPD-*A-G2 (spring to close) NOTE: HGPD series has sealing port for wet applications</p> <p>HGPT-*A-B HGPT-*A-B-G1 (spring to open) HGPT-*A-B-G2 (spring to close) NOTE: HGPT series has sealing port for wet applications</p> <p>HGPL-*A-B NOTE: Due to the greater range of motion, special consideration shall be given during the Machine Risk Assessment for angular grippers when an operator is loading in proximity of the gripper.</p> <p><u>Schunk</u> PGN plus * PGN-plus *-IS (spring to open) PGN-plus *-AS (spring to close) NOTE: PGN plus series has sealing port for wet applications</p> <p>DPG-plus *-* DPG-Plus *-*-IS (spring to open) DPG-Plus *-*-AS (spring to close) NOTE: DPG plus series has sealing port for wet applications</p> <p>SMC MHZ2-*D MHZ2-*D-X12 (spring to open) MHZ2-*D-X7 (spring to close)</p>	
b) 2 Jaw (Angular)	<p>NOTE: Due to the greater range of motion, special consideration shall be given during the Machine Risk Assessment for angular grippers when an operator is loading in proximity of the gripper.</p> <p><u>Schunk</u> DRG *-* DRG *-*-IS (spring to open) DRG *-*-AS (spring to close) NOTE: DRG series has sealing port for wet applications</p>	
c) 3 Jaw (Parallel)	<p><u>Festo</u> DHDS-*A DHDS-*A-NC (spring to close)</p> <p>HGDD-*A HGDD-*A-G1 (spring to open) HGDD-*A-G2 (spring to close) NOTE: HGDD series has sealing port for wet applications</p> <p>HGDT-*A HGDT-*A-G1 (spring to open) HGDT-*A-G2 (spring to close) NOTE: HGDT series has sealing port for wet applications</p> <p><u>Schunk</u> DPZ-plus * DPZ-plus *-IS (spring to open) DPZ-plus *-AS (spring to close) NOTE: DPZ series has sealing port for wet applications</p>	

Component	Requirements	Examples
6. Escapements	<u>SMC</u> MIS32TF-*D MIW32TF-*D  <u>Festo</u> HPV-*-*A HPVS-*-*A	
7. Rotary Actuators	NOTE: Actuators with shock absorbers used with a center-exhaust valve can create unintended motion after power is removed from valve.  <u>Festo</u> DSM-B DRRD  <u>SMC</u> MSQ*A-XF CRB**-*A	
8. Pneumatic Clamps		
a) Toggle Clamps	NOTE: When air is lost to toggle clamps, they will stay clamped with force.	<u>Destaco</u> 802-UE 82L*G-2**B800  <u>Elsa-ganter</u> 862  <u>KIFIX</u> KF-017 DB P
b) Swing Clamps	NOTE: Requires the Fluid Power Engineer's prior approval. NOTE: When air is lost to swing clamps, they will relax and lose clamping force. Special consideration must be taken so that a loss of clamping force will not cause a hazard, interrupt process requirements, or damage tooling or the product.  Destaco	<u>Destaco</u> 9500 Series
9. Stopper Actuators (shot pin)	<u>Festo</u> DFSP-32-25-S-PA (double acting, spring advance)	
C. Conductors		
1. Hose		
a) Sizes 1/4" - 1"		<u>Parker</u> Push-Lok 801 Series
b) Sizes 1-1/4" - 2"		<u>Parker</u> GST II (Series 7092, Red)
2. Velocity Fuse	Ross "Hoze-Fuze" Velocity fuse required on supply inlet of hose 3/4" and larger.	

Component	Requirements	Examples
3. Polyurethane Tubing	6, 10mm tubing sizes only NOTE: Must be suitably protected using nylon spiral wrap and tubing clamps.	
a) Normal Applications	<u>Festo</u> PUN-H-6x1-SW (Black) 197391 PUN-H-6x2-BL (Blue) 197384 PUN-H-10x1.5-SW (Black) 197393 PUN-H-10x1.5-BL (Blue) 197386 With QS-G series fittings (G thread)  <u>SMC</u> TUH0604B-* (Black) TUH0604BU-* (Blue, translucent) TUH1065B-* (Black) TUH1065BU-* (Blue, translucent) With KQ2 Series Fittings (G thread)	
b) Welding / High Temperature Applications	<u>Festo</u> PAN series with Festo NPQH fittings and Turck silicone cover, ST ID 3/8" / 30mm or ST ID 1/2" / 30mm	
4. Steel Tubing	SAE J524 (Metric) or SAE J525 (English) NOTE: Metric tubing preferred for all applications	DIA. x Wall Thickness R6 (0.236) x 1 (0.039) R10 (0.393) x 1 (0.039) R12 (0.472) x 1.5 (0.059) R20 (0.787) x 2 (0.078) R25 (0.984) x 2.5 (0.098)
5. Steel Tubing Support Clamp	Per DIN 3015, Part 1	<u>Hydro-Craft</u> Hydro-strut Hydro-clamp  <u>Hydac</u> HRL, HRS  <u>Zsi</u>  <u>Stauff</u>
D. Connectors		
1. Fittings	ISO 1179-1 (ports) for ISO 228-1 (threads) only. Threaded connections smaller than M5 are not permitted.	
a) Adapters	SAE J514 (O-Ring Flat Face Seal)  ISO 8434-2 (37 Degree conductor connections only for pneumatic connections)	
b) Quick Disconnects		
1) General	Mil-C-4109E Industrial Interchange only	<u>Parker</u> B33E  <u>Hansen</u> 3000-11B
2) Bubble-Tight	<u>Swagelok</u> "QC" & "QF" Series	
c) Polyurethane	<u>Festo</u> QS-G- Quick Star (BSPP thread)  <u>SMC</u> KQ2-A	



Component	Requirements	Examples
d) Steel	37 Degree - SAE J514 and ISO 8434-2 or O-ring face seal - SAE J1453 / ISO 8434-3	Parker Triple-Lok Seal-Lok
e) Swivel, Rotary Unions	Dueblin Aeroquip	
E. Air Preparation (Filter, Regulator, and Lubricator)	For standard application general use, air quality shall meet ISO 8573-1:2010 [5:X(5):5] For sensitive applications, air quality shall meet ISO 8573-1:2010 [1.3.2] Metal Bowl, manual drains only. NOTE: Standardize on the 3/4 size whenever possible. NOTE: G1/8, G1/4, G1/2, and G1 require the Fluid Power Engineer's prior approval.	
1. Filters	NOTE: Festo - Use 3/4" connecting plates with air prep assembly. NOTE: Nexteer standardizes on left-to-right air flow. 40 micron filter on the left most side and the 5 micron filter on the right most side.	
a) 40 Micron	<u>Festo</u> MS6-LF-1/2-E-U-M 40m 529619 MS6-LFP-E (element) 40m 534500  <u>SMC</u> AF50-F06-27-40-A 40m AF50P-060S-7-40B (element) 40m	
b) 5 Micron	<u>Festo</u> MS6-LF-1/2-C-U-M 5m 529611 MS6-LFP-C (element) 5m 534499  <u>SMC</u> AF50-F06-8-A 5m AF50P-060S (element) 5m	
c) Coalescing	NOTE: Requires the Fluid Power Engineer's prior approval.  MS6-LFM-1/2-A-U-M -DA 0.01m 527670 MS6-LFM-A 532909	
d) Reclassifier	<u>Festo</u> LFU-1/2 10494 LFPU-1/2 (element) 10496 LFU-1 10495 LFPU-1 (element) 10497	
e) Mounting Bracket	<u>Festo</u> MS6-WP (assembly mount) 532195 MS6-WB (stand-alone mount) 532196 MS6-MV1 (module connector) 8119204  MS12-WP (assembly mount) 537133 MS12-MV (assembly connector) 537134  <u>SMC</u> Y600T Y600T-A	
f) Branch Module	<u>Festo</u> MS6-FRM-1/2 529853 MS12-FRM-G 541681	

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Component	Requirements	Examples
2. Check		
a) In-Line	<u>Festo</u> H-1/4-B G1/4 11689 H-1/2-B G1/2 11691  <u>SMC</u> AKB02A-02S 1/4 R AKB04A-04S 1/2 R	
b) Pilot Operated	<u>Festo</u> HGL-M5-B M5 530029 HGL-1/8-B G1/8 530030 HGL-1/4-B G1/4 530031 HGL-3/8-B G3/8 530032 HGL-1/2-B G1/2 530033	
c) Manual Override	<u>Festo</u> HAB-1/8 G1/8 184585 HAB-1/4 G1/4 184586 HAB-3/8 G3/8 184587 HAB-1/2 G1/2 184588  <u>Aladco</u> 312501BSPP G1/4	
3. Directional (electronically controlled)	ISO 15407-2:2003 26mm (size 26) only  ISO 5599-2:2001 52mm (size 2E) only  24VDC, Manual Non-locking flush overrides. Wiring Configuration for individual sub-base (M12 connector) ISO 20401:2017 IEC 60947-5-2:2007, Figure D.2	
a) Manifold Mount, 5-Way	<u>Festo</u> Discrete Multi-Pin Connector 44E-MP1-P+G* (electrical) 539215 44P-N-X-*B-* (pneumatic)  IO-Link Serial Connector 44E-LK-P (electrical) 44P-N-X-*B-* (pneumatic)	
ISO 15407-2, 26mm		
(*) = Configuration selection code (37 Pin External Pilot only) Up to 22 coils (IP65 or 67)	NOTE: Each base accommodates 2 valves or 4 addresses. NOTE: At the time of this release the Festo configurator does not include the electrical power separation module for IO-Link manifolds. If this module is required, this will have to be ordered separately and installed onsite. See below for part number.	

Component	Requirements	Examples
	<u>Festo (VTSA series)</u>	
5/2 Valve, Single Solenoid, Spring Offset (O)	VSVA-B-M52-MZD-A1-1T1L	539159
5/2 Valve, Double Solenoid, Detent (J)	VSVA-B-B52-ZD-A1-1T1L	539156
5/3 Valve, Double Solenoid, Open Center (E)	VSVA-B-P53E-ZD-A1-1T1L	539161
5/2 Valve, Single Solenoid, Spring Offset (SO) (with spool monitoring. Commonly used for brake applications)	VSVA-B-M52-MZD-A1-1T1L-APP	560724
3/2 Valve, Dual 3-Way Solenoid, N.C., N.C. (K) (commonly used for conveyor pallet control. Not for cylinder control)	VSVA-B-T32C-AZD-A1-1T1L	539150
Single Sandwich Reg (6 bar) (ZFY)	VABF-S4-1-R1C2-C-6E	549876
Gauge (BAR/PSI) (U)	PAGN-26-10-P10	543488
Gauge (Mpa) (WU)	PAGN-26-1M-P10	563736
Manifold Sub-base (Dbl) (B)	VABV-S4-1S-G14-2T2	539220
Manifold End Plate – L (discrete) (MP1)	VABE-S6-1LT-C-M1-S37	543414
Manifold End Plate - L (IO-Link) (LK)	VABA-S6-1-PT	8152353
Power Separation Module	VABF-S6-1-E3C16-C-R3	569126
Manifold End Plate – R (X)	VABE-S6-1RZ-G12	539236
Individual Sub-base (M12)	VABS-S4-1S-G14-R3	541063
5 Pin / 5 Meter Cable (M12)	NEBU-M12G5-K-10-LE5	554038
Blanking Plate (L)	VABB-S4-1-WT	539212
37 Pin, 27 Wire Cable (5 Meter) (GO)	NEBV-S1W37-KM-5-LE27	543275
37 Pin, 27 Wire Cable (10 Meter) (GP)	NEBV-S1W37-KM-10-LE27	543276
Non-Locking Manual Override Cap (N) Override Cap (Pkg of 10)	VAMC-S6-CH	541010
Vertical Supply Plate, Port 11 (ZU)	VABF-S4-1-P1A3-G14	540171
Supply Block Plate (K)	VABF-S6-1-P1A6-G12	539230
Separator plate (US) (Required for Supply Plate above – Select option K)	VABD-S6-1-P3-C	539228
	<u>SMC</u>	
Manifold Assembly	VV801*-03F-MD0-W1-R-Q	
5/2 Valve, Single Solenoid, Spring Offset	VSR8-4-FG-S-3VZR	
5/2 Valve, Double Solenoid, Detent	VSR8-4-FG-D-3VZR	
5/3 Valve, Double Solenoid, Open Center	VSR8-4-FJG-D-3VZR	
3/2 Valve, Dual 3-Way Solenoid, N.C., N.C. (commonly used for conveyor pallet control. Not for cylinder control)	VSR8-4-FDAG-D-3VZR	
Regulator Plate, Single, Long (PSI/BAR)	VVS8040-ARB-P-1-X1L	
Regulator Plate, Single, Short (PSI/BAR)	VVS8040-ARB-P-1-X1S	
Manifold Sub-base (Sgl)	MBS8040-03F-D-1	
Manifold End Plate (Left)	MES804D-04F-R	
Manifold End Plate (Right)	MES804U-04F	
Blanking Plate	VVS8040-11A	
Cable, 26 pin, Circular, 5m cable (MD3)	AXT100-MC26-050	
Circular Connector Housing Asm.	VVQC1000-M26-1	
Vertical Supply Plate	VV801-P-03F	
Supply Block Plate	VVS8040-16A	
Tie Rods	VV801-TR-**	
Fanuc robot EE connector	UIUSP-DUP01068	
	<u>Aventics (previously known as Numatics)</u>	
Manifold Assembly Kit	G503AVM*300V14X, G503AMM22MA0020, Assembled	
Single Solenoid Offset	R503A2B10MA00F1	
Double Solenoid Detent	R503A2B40MA00F1	
Double Solenoid 3 Position	R503A2B50MA00F1	
Dual 3-Way Valve	R503A2BD0MA00F1	
(commonly used for brake applications and for conveyor stops. Not for cylinder control)		
Single Sandwich Reg (9 bar)	R503ARS12JA0020	
Gauge	MSO2AG521734006	
Manifold Sub-base (Dbl)	G503AMM22MA0020	
Manifold End Plate – L (37 Pin Ext Pilot)	P599AE428442001	
Manifold End Plate – R	G503AK428327013	
Individual Sub-base (M12)	G503AA3A3M59W20	
Blanking Plate	P503AB428359001	
37 Pin / 5 Meter 27 Wire Cable	SC3705MCX0000000	
Vertical Supply Plate	G503AW428300003	

NOTE: SMC long and short regulators must alternate when installed next to each other.

Component		Requirements	Examples
b) Manifold mount, 5-way		NOTE: Requires the Fluid Power Engineer's prior approval.	
ISO 5599-2, 52mm			
(*) = Configurator selection code Up to 22 coils (IP 65 or 67)		<u>Festo</u> 44E-MP1-P+GO (electrical) 539215 44P-N-X-*D-**** (pneumatic)  NOTE: Each base accommodates 2 valves or 4 addresses.	
5/2 Valve, Single Solenoid, Spring Offset	(O)	<u>Festo</u> VSVA-B-M52-MZD-D2-1T1L 560821	
5/2 Valve, Double Solenoid, Detent	(J)	VSVA-B-B52-ZD-D2-1T1L 560818	
5/3 Valve, Double Solenoid, Open Center	(E)	VSVA-B-P53E-ZD-D2-1T1L 560823	
Single Sandwich Reg (6 bar)	(ZF)	VABF-S2-2-R1C2-C-6 555771	
Manifold Sub-base	(D)	VABV-S2-2S-G12-T2 560841	
Manifold End Plate – L (discrete)	(MP1)	VABE-S6-1LT-C-M1-S37 543414	
(37 Pin Ext Pilot)			
Manifold End Plate – R	(X1)	VABE-S6-2RZ-G34 560839	
Individual Sub-base (M12)		VABS-S2-2S-G12-R3 555640	
Blanking Plate	(L)	VABB-S2-2-WT 560845	
Gauge (BAR/PSI)	(U)	PAGN-40-10-P10 548009	
Gauge (MPa)	(WU)	PAGN-40-1M-P10 563738	
37 PIN/5 Meter 27 Wire cable	(GO)	NEBV-S1W37-KM-5-LE27 543275	
37 Pin, 27 Wire Cable (10 Meter)	(GP)	NEBV-S1W37-KM-10-LE27 543276	
Non-Locking Manual Override Cap	(N)	VAMC-S6-CH 541010	
Override Cap (Pkg of 10)			
Vertical Supply Plate, Port 11	(ZU)	VABF-S2-2-P1A3-G12 555786	
c) 2/3-Way Valve Air Pilot		<u>Festo</u> VL/O-3-1/4 9984 VL/O-3-1/2 9983 VL/O-3-3/4 10049  <u>Festo</u> MFH-3-1/4-S 7959 MFH-3-1/2-S 7960 MFH-3-3/4-S 11968  w/ 24VDC solenoid coil MSFG-24/42-50/60 4527  Peter-Paul Leak Test NOTE: Requires the Fluid Power Engineer's prior approval.	
d) Press-Brake/Clutch		<u>Ross</u> 3573A5152W 24VDC 3/4 NPT Crossflow with L-G monitor NOTE: Other sizes requires the Fluid Power Engineer's prior approval. NOTE: Pressure Switch monitoring of lockout indicator (port "L") and pneumatic reset are required.	

Component	Requirements			Examples
e) Safety Blocking Valve (safety exhausting valve)	<u>Ross</u> DM1CDB20A31 G1/4 DM1CDB42A31 G1/2 DM1CDA54A31 G3/4 DM1CDA55A31 G1  <u>Norgren/Herion XSz Series</u> XSZ-8 G1/4 2492806.3053.024.00 PSV XSZ-8, DBL-SOL, W/ DIN-B Solenoids & Connectors  XSZ-10 G1/2 2492930.3053.024.00 PSV XSZ-10, DBL-SOL, W/ DIN-B Solenoids & Connectors  XSZ-20 G3/4 2493038.0201.024.00 PSV XSZ-20, DBL-SOL, W/ DIN-A Solenoids & Connectors  XSZ-32 G1 2493130.0801.024.00 PSV XSZ-32, DBL-SOL, W/ DIN-A Solenoids & Connectors  NOTE: The PSV fault indicator is required for each Norgren/Herion valve and must be ordered/assembled separately. 1028063, PSV fault indicator.			
f) Proportional Valve	NOTE: Requires the Fluid Power Engineer's prior approval.			
1) Directional	<u>Festo</u> MPYE VPWP  <u>Norgren</u> VP60			
2) Pressure	<u>Fairchild</u> 7800 series I/P  <u>Rosemount</u> 3051C  <u>Emerson</u> High Flow  <u>SMC</u> ITV1050-33F2L4 ITV3050-33F4L5			
4. Flow Control				
a) Meter-In (Nexteer standard)	<u>SMC</u> AS1210-M5 M5 AS2210-G01-X396 G1/8 AS2210-G02-X396 G1/4 AS4210-G04-X396 G1/2  <u>Festo</u> GRLZ-M5-B M5 151183 GRLZ-1/8-B G1/8 151188 GRLZ-1/4-B G1/4 151195			

Component	Requirements	Examples
b) Meter-Out (Nexteer PO check circuits / special applications)	<u>SMC</u> AS1200-M5 M5 AS2200-G01-X396 G1/8 AS2200-G02-X396 G1/4 AS4200-G04-X396 G1/2  <u>Festo</u> GRLA-M5-B M5 151160 GRLA-1/8-B G1/8 151165 GRLA-1/4-B G1/4 151172 GRLA-3/8-B G3/8 151178 GRLA-1/2-B G1/2 151179	
c) Meter-In or Meter-Out (In-Line)	<u>SMC</u> AS1000-M5 M5 AS2000-F01 G1/8 AS2000-F02 G1/4 AS3000-F03 G3/8 AS4000-F04 G1/2	
(Door Applications)	<u>SMC</u> AS2001F-06T Tamper-Proof ASD330F-01-06ST Tamper-Proof NOTE: Use SMC AS-T-1 to adjust Tamper-Proof flow controls above.	
5. Relief	SME Certified	Watts Jayco
6. Safety Lock-Out with Exhaust	Lockable in the OFF position only	
a) 3/4"	<u>Ross</u> Y1523C5012 3/4 NPT  <u>Festo</u> HE-N3/4-LO 3/4 NPT 197131	
b) 1-1/4" - 2"	<u>Ross</u> Y1523C7012 1-1/4 NPTF Y1523C8002 1-1/2 NPTF Y1523C9012 2 NPTF  <u>Norgren</u> C0022C 1-1/4 NPTF C0022D 1-1/2 NPTF	
7. Shuttle	<u>Festo</u> OS-1/4-B G1/4 6682	
8. Temperature Control - Air Operated	<u>Powers</u> Accritemp II Rigit Bulb Controller and 593 Flowrite II Control Valve  <u>H.O. Trerice</u> 87700 Pneumatic Controller with 910 Series Control Valve	

Component	Requirements	Examples																																	
9. Quick Exhaust	<p>NOTE: Quick exhausts are not to be used as a method of decreasing stop distance relating to safeguarding placement.</p> <p><u>Festo</u></p> <table> <tr> <td>SEU-1/8</td><td>G1/8</td><td>4616</td></tr> <tr> <td>SEU-1/4</td><td>G1/4</td><td>6753</td></tr> <tr> <td>SEU-3/8</td><td>G3/8</td><td>6755</td></tr> <tr> <td>SEU-1/2</td><td>G1/2</td><td>6822</td></tr> <tr> <td>VBQF-U-G18-E</td><td>G1/8</td><td>547531</td></tr> <tr> <td>VBQF-U-G14-E</td><td>G1/4</td><td>548001</td></tr> </table> <p><u>SMC</u></p> <table> <tr> <td>AQ2000-F01</td><td>G1/8</td><td></td></tr> <tr> <td>AQ2000-F02</td><td>G1/4</td><td></td></tr> <tr> <td>AQ3000-F03</td><td>G3/8</td><td></td></tr> <tr> <td>AQ5000-F04</td><td>G1/2</td><td></td></tr> <tr> <td>AQ5000-F06</td><td>G3/4</td><td></td></tr> </table>	SEU-1/8	G1/8	4616	SEU-1/4	G1/4	6753	SEU-3/8	G3/8	6755	SEU-1/2	G1/2	6822	VBQF-U-G18-E	G1/8	547531	VBQF-U-G14-E	G1/4	548001	AQ2000-F01	G1/8		AQ2000-F02	G1/4		AQ3000-F03	G3/8		AQ5000-F04	G1/2		AQ5000-F06	G3/4		
SEU-1/8	G1/8	4616																																	
SEU-1/4	G1/4	6753																																	
SEU-3/8	G3/8	6755																																	
SEU-1/2	G1/2	6822																																	
VBQF-U-G18-E	G1/8	547531																																	
VBQF-U-G14-E	G1/4	548001																																	
AQ2000-F01	G1/8																																		
AQ2000-F02	G1/4																																		
AQ3000-F03	G3/8																																		
AQ5000-F04	G1/2																																		
AQ5000-F06	G3/4																																		



## 5. Machine Hydraulic Components

The "Component" column is organized by component type. Nexteer Automotive does not have requirements for technologies not listed.

The "Requirements" column has two functions:

- 1) Where component brand or part numbers are designated, this is the Nexteer Automotive approved (required) component.
  - Where multiple brands or part numbers are listed, OEM's are allowed to select the one that provides the best value. Components are not listed in any preferred order.
- 2) Where specifications are provided, components are required to meet these specifications.

NOTE: To identify regional requirements, the following notations are used: (B) - Brazil; (C) - China; (I) - India; (E) - Europe & Morocco; and (NA) - North America. If not specifically noted with region letter designation, any of the designated components may be used.

The "Examples" column lists components that meet the requirements listed in the "Requirements" column. The example components are not required.

NOTE: All threaded pressurized fittings shall be BSPP (G) thread. Tube or hose connections shall be O-ring face seal only.

NOTE: If Continental products are selected, they are to be used on US machines only. Continental is not permitted for use in Mexico, Europe, or Asia.

NOTE: Changes since the last revision are highlighted

Component	Requirements	Examples
<b>A. Accessories</b>		
1. Accumulators	NOTE: Region certification required NOTE: Top load required	
a) Bladder Type	<u>Parker</u> VGU/F.25/250.8TS5.3 charge kit required with each machine equipped with accumulator.  IS04570-8VI or .305-32 fill connector only.	<u>Hydac</u> SB330TR  <u>Nacol</u> 210 series 3000 PSI  <u>Parker</u> (I) BA-***-T Series
Australian - AS1210 (B) - ASME or PED (C) - SELO (ASME/PED) (E) - PED, CE (NA) - ASME		
b) Piston Type	NOTE: Requires the Fluid Power Engineer's prior approval.	
	<u>Tobul</u> A30 Series                      3000 PSI	
c) Pulsation / Noise Suppressors	<u>Wilkes and McLean</u> WM                              201 BAR	
2. Accumulator Safety Block	<u>Bosch-Rexroth</u> ABZSS, Version E  <u>Hydac</u> SAF**E16Y1N250AS**L	
3. Air Breather (3 Micron)	<u>Schroeder</u> ABF-3/10-M-P12  <u>Vickers (by Danfoss)</u> BR-210  <u>Hydac</u> BLBN080G10W	
4. Flow Meter		
a) Electrical	NOTE: Requires the Fluid Power Engineer's prior approval.	
	<u>VSE</u> VS Series	

Component	Requirements	Examples															
b) Visual	<p>NOTE: 6000 PSI basic stainless-steel flow meter</p> <p><u>Hedland</u></p> <table><tr><td>H702S - 002</td><td>0.2-2.0 GPM</td><td>G3/4</td></tr><tr><td>H702S - 005</td><td>0.5-5.0 GPM</td><td>G3/4</td></tr><tr><td>H702S - 010</td><td>1-10.0 GPM</td><td>G3/4</td></tr><tr><td>H702S - 020</td><td>2-20.0 GPM</td><td>G3/4</td></tr><tr><td>H702S - 030</td><td>3-30.0 GPM</td><td>G3/4</td></tr></table>	H702S - 002	0.2-2.0 GPM	G3/4	H702S - 005	0.5-5.0 GPM	G3/4	H702S - 010	1-10.0 GPM	G3/4	H702S - 020	2-20.0 GPM	G3/4	H702S - 030	3-30.0 GPM	G3/4	
H702S - 002	0.2-2.0 GPM	G3/4															
H702S - 005	0.5-5.0 GPM	G3/4															
H702S - 010	1-10.0 GPM	G3/4															
H702S - 020	2-20.0 GPM	G3/4															
H702S - 030	3-30.0 GPM	G3/4															
5. Flow Switches	<p><u>Hedland</u></p> <p>H702B-***-F1 - Flow alert flow switch</p> <p><u>IFM Efector</u></p> <p>SI5010 (Fast response) with: E40096 M18x1.5, G1/4 adapter, or E40106 M18x1.5, 1/4NPT adapter and U40030 1/2" NPT tee. NOTE: Pressure applications of 1450-4350 PSI</p> <p>SA5000 NOTE: Comes with temperature monitoring NOTE: 2 digital outputs, 1 digital output (4-20mA) NOTE: Pressures less than 1450 PSI</p> <table><tr><td>SM6004</td><td>0-6.6 GPM</td><td>G1/2</td></tr><tr><td>SM7004</td><td>0-13.2 GPM</td><td>G3/4</td></tr><tr><td>SM8004</td><td>0-26.4 GPM</td><td>G1</td></tr><tr><td>SM9004</td><td>1.3-80 GPM</td><td>G2</td></tr><tr><td>SM2004</td><td>1.3-160 GPM</td><td>G2</td></tr></table> <p>NOTE: Comes with temperature monitoring NOTE: 2 analog outputs (4-20mA) NOTE: Pressures less than 230 PSI</p> <p><u>Universal Flow Monitors (UFM)</u> CP4-M1T1C1 1.2-12GPM NOTE: De-ionized or Distilled Water Applications only</p>	SM6004	0-6.6 GPM	G1/2	SM7004	0-13.2 GPM	G3/4	SM8004	0-26.4 GPM	G1	SM9004	1.3-80 GPM	G2	SM2004	1.3-160 GPM	G2	
SM6004	0-6.6 GPM	G1/2															
SM7004	0-13.2 GPM	G3/4															
SM8004	0-26.4 GPM	G1															
SM9004	1.3-80 GPM	G2															
SM2004	1.3-160 GPM	G2															
6. Coupling, Drive	<p><u>Magnaloy</u></p> <p>"Load Lock" with "H" Insert</p> <p><u>KTR</u></p> <p>Rotex Standard</p>																
7. Gauge																	
a) Pressure	<p>2.5" Diameter 3000 PSI 2% accuracy Dual scale PSI/Mpa 1/4"NPT</p>																
b) Gauge adapter	<p>NOTE: 12 x 1.5 connection is required</p> <p><u>Schroeder</u></p> <table><tr><td>S1215DCNPT14</td><td>1/4 NPT</td></tr></table>	S1215DCNPT14	1/4 NPT														
S1215DCNPT14	1/4 NPT																
c) Pressure Tap, Test Port	<p>NOTE: 12 x 1.5 connection is required</p> <p><u>Schroeder</u></p> <table><tr><td>SP1215G14WDP</td><td>G1/4</td></tr></table>	SP1215G14WDP	G1/4														
SP1215G14WDP	G1/4																
8. Flow Divider	NOTE: Requires the Fluid Power Engineer's prior approval.																
9. Isolation Mounts (Pump Mounting)	<p><u>VMC</u></p> <p>RD Series</p> <p><u>Korfund</u></p> <p>Double deflection</p>																

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Component	Requirements	Examples
19. Water Strainer	Bronze 300 PSI 20 Mesh Stainless Wire Screen	<u>Thermal Transfer</u> 65297 1 NPT
20. Water Flow Indicator		
a) Flapper Sight Indicator	<u>John C. Ernst</u> 142	
B. Actuators		
1. Linear	ISO 6020 (Tie Rod) or 6022 (Mill Style) Stroke adjusters, cushions, removable rod gland seals and female rod end with alignment coupler required.  Acceptable mounting types: ME5, ME6, MP5, MS2, MT4	
a) >25mm - 200mm Bore	<u>Bosch-Rexroth</u> <b>NOTE: CDT3 requires the Fluid Power Engineer's prior approval.</b> CDT3 2320 PSI / 160 BAR CDT4 (NFPA mount only) 2900 PSI / 200 BAR CDH2 3625 PSI / 250 BAR  <u>Danfoss Hydro-line</u> HM (6020) 3045 PSI / 210 BAR IHM (6020) 3045 PSI / 210 BAR  <u>Parker</u> MMA (6022) HMI	
b) < 25mm Bore	<u>Aurora</u> <u>Tom Thumb – EH</u> <u>Parker</u>	
2. Motors (hydraulic)	<u>Vickers (by Danfoss)</u> Char-Lynn series  <u>Bosch-Rexroth</u> A4FM	
3. Rotary Actuators		
a) Vane	<u>Parker</u> Tork-Mor Series	
b) Cylinder	<u>PHD</u> Moog Flo-Tork	
4. Clamps	<u>Vektak</u> <u>Enerpac</u>	
C. Conductors		
1. Hose	ISO 4413, 9.5 SD-013, Hydraulic Addendum ISO 1436-1 (C) ISO 3862-1 (I) ISO-18752 (E) SAE J517 (NA)	
a) 1/4" - 1-1/4"		Parker 387TC - with 43 series fittings
a) 1-1/2" - 2"		<u>Parker</u> 787TC - with 77 series fittings

Component	Requirements	Examples
2. Pipe	ISO 4413, 9.2 SD-013, Hydraulic Addendum NOTE: Pressure lines must be rated for 3000 PSI with 4:1 safety factor.	
a) 1/4"		Sch. 40 standard
b) 3/8", 1/2", 3/4"		Sch. 80 extra strong
c) 1", 1-1/4", 1-1/2", 2"		Sch. 160 double extra strong
3. Steel Tubing	NOTE: Metric tubing preferred for all applications  ISO 3304 or SAE J524	Dia. x Wall Thickness R6 x 1 R10 x 1.5 R12 x 2 R20 x 2.5 R25 x 3 R30 x 4 R38 x 5
4. Tubing & Pipe Support Clamps	DIN 3015, Part 1	<u>Hydro-Craft</u> Hydro-Strut Hydro-Clamp  <u>Zsi</u>  <u>Stauff</u>  <u>Hydac</u> HRL HRS
D. Connectors	ISO 1179-BSPP	
1. Fittings		
a) Needle Valve	BSPP	<u>Parker</u> NS
b) Disconnect, Quick	MIL-C-25427A (valved both sides)	<u>Hansen</u> Aeroquip FD-56
c) Disconnect, Quick Fill Point	<u>Parker</u> H8-63 with H8-66 dust cover (1") – Hydraulic H6-63 with H6-66 dust cover (3/4") – Lubrication NOTE: Dust cover required	
d) Steel Tubing Connection	SAE J1453 or ISO 8434-3 (O-ring Face Seal)	<u>Parker</u> Seal-Lok or Parflange
e) Swivel, Rotary Union	<u>Dueblin</u> <u>Aeroquip</u> Single Connection  <u>Carr-Lane</u> Multi-Connections	
2. Flanges	SAE J-514 or J-518	DMIC Anchor Parker
E. Fluid Conditioning	ISO 4406	
1. Filter	Must meet SAE J2066 specification. Also known as the GM HF3 and HF4 and conform to ISO 4413, 8.3 and SD-013, Hydraulic Addendum.  Initial fill / fluid requirements shall meet a cleanliness level of (17/15/13) per ISO 4406.	

Component	Requirements	Examples
a) Pressure	Pall, Schroeder, or Hydac elements only.	<u>Schroeder</u> KF30, KF50, KC50, KFH50, MKF50  <u>Pall</u> 9660, 9710  <u>Hydac</u> HF3P, HF4P
b) Return	Pall, Schroeder, or Hydac elements only	<u>Schroeder</u> RT, TF3, KF3, KFH50, KTK, KTF  <u>Pall</u> 8800, 8900, 6300, 6400  <u>Hydac</u> HF4R
2. Heat Exchanger		
a) Air – Oil	NOTE: Requires the Fluid Power Engineer's prior approval.  <u>Thermal Transfer</u> RM-*-*-*43  <u>Bosch-Rexroth</u> KOL  <u>Hydac</u>	
b) Water – Oil		
1) Shell and Tube	<u>Thermal Transfer</u> EKM-*-*-*R EKFM-*-*-*R  <u>ITT Standard</u> BCF	
2) Plate	<u>Hydac</u> HEX***-**CB*	
c) Chiller (Water Glycol)	<u>Hydac</u> RFCS-BL-****/1.0/W/**-*/A/1/FM/000  <u>Kelvin</u>  <u>Koolant Koolers</u>  <u>Daikin</u>	
F. Valves		
1. Air Bleed	<u>Vickers (by Danfoss)</u> ABS  <u>Hydac</u> AEV-6/12	

Component	Requirements	Examples
2. Ball		
a) Low Pressure	Pump inlet, 400 PSI, full port, ¼ turn	<u>DMIC</u> BVAL-0250B-4323 G1/4 BVAL-0375B-4323 G3/8 BVAL-0500B-4323 G1/2 BVAL-0750B-4323 G3/4 BVAL-1000B-4323 G1 BVAL-1250B-4323 G1-1/4 BVAL-1500B-4323 G1-1/2
b) High Pressure	Up to 6000 PSI, full port, ¼ turn	<u>DMIC</u> BVH-0250B-1113 G1/4 BVH-0375B-1113 G3/8 BVH-0500B-1113 G1/2 BVH-0750B-1113 G3/4 BVH-1000B-1113 G1 BVH-1250B-1113 G1-1/4 BVH-1500B-1113 G1-1/2  <u>Hydac</u> KHB-G1/4-1114-01X-A G1/4 KHB-G3/8-1114-01X-A G3/8 KHB-G1/2-1114-01X-A G1/2 KHB-G3/4-1114-01X-A G3/4 KHB-G1-1114-01X-A G1 KHM-G11/4-1114-01X-A G1-1/4 KHM-G11/2-1114-01X-A G1-1/2 KHM-G2-1114-01X-A G2
3. Gauge Isolator	<u>Parker</u> 9GT400SV  <u>Hydac</u> MS4 or MS6	
4. Check		
a) In-Line or Gasket-Mounted	<u>Bosch-Rexroth</u> S, MS-R  <u>Parker</u> 9C	
b) Pilot Operated	<u>Parker</u>	
5. Directional		
a) Cartridge, Screw-In	NFPA/T3.5.50-200x	<u>Vickers (by Danfoss)</u> <u>Bosch-Rexroth</u> <u>Continental</u> - Command Controls components only. SUN products are not permitted.
b) Cartridge, Slip-In	ISO 7368 (24342)	<u>Vickers (by Danfoss)</u> <u>Bosch-Rexroth</u>
c) Deceleration and Feed	NOTE: Requires the Fluid Power Engineer's prior approval.	
d) Four-Way	ISO 4413, 7.4. SD-013, Hydraulic Addendum  Indicator lights, wet armature solenoids, molded 4 pin M12x1 plug in connector (Per ISO 9461) wired according to ANSI/B-93.9-1988 (R-1988) Section: 5 (7.4.3). Flush manual non-locking overrides and 24VDC coils with surge protector.	Energizing Solenoid A (Pin 2) connects port P to A, Energizing Solenoid B (Pin 4) connects port P to B.  <p>Single Solenoid Directional Valve with M12 Male Connector Pin-assignment</p> <p>Solenoid</p> <p>Pin 1 - Not Used Pin 2 - Not Used Pin 3 - 0V Common Pin 4 - 24 VDC Solenoid</p>

Component	Requirements	Examples
1) D03 – ISO 4401		
a) Single Solenoid Spring Return	<u>Vickers (by Danfoss)</u> DG4V-3-2A-M-FPM4WL-D7-H7-60-EN623 30W  <u>Bosch-Rexroth</u> 4WE6D6X/EG24N9DK35L/62=AN 30W  <u>Continental</u> VSD03M-1A-GBD4-70L-C 24W	
b) Double Solenoid Detented	<u>Vickers (by Danfoss)</u> DG4V-3-2N-M-FPM4WL-D7-H7-60-EN623 30W  <u>Bosch-Rexroth</u> 4WE6D6X/OFEG24N9DK35L/62=AN 30W  <u>Continental</u> VSD03M-2A-GBD4-70L-C 24W	
c) Double Solenoid Spring Center Float Spool A&B to T	NOTE: Blocked center is not permitted.  <u>Vickers (by Danfoss)</u> DG4V-3-6C-M-FPM4WL-D7-H7-60-EN623 30W  <u>Bosch-Rexroth</u> 4WE6J6X/EG24N9DK35L/62=AN 30W  <u>Continental</u> VSD03M-3F-GBD4-70L-C 24W	
d) Valves with Monitored Spool Positions (for Safety Applications)	<u>Vickers (by Danfoss)</u> DG4V3-2A-M-S4-FPA5WL-H-2-60	
e) Safety Manifold (BSPP, w/M5x.8 Metric Bold)	<u>MED-KAS</u> 29902  <u>Continental</u> IC-0302-XXX-D-M-1317	
f) Bubble Tight for Use with Air Over Oil Applications	<u>Hawe</u> Single solenoid, Spring Offset NBVP 16 W-G24 30W 3 Pos., Spring Centered, A&B-T NBVP 16 D-G24 30W	
2) D05 ISO 4401		
a) Single Solenoid Spring Return	<u>Vickers (by Danfoss)</u> DG4V4-012A-M-PM4WL-D7-HL-4-10-S607  <u>Bosch-Rexroth</u> 4WE10D4X/CG24N9DK35L=AN  <u>Continental</u> VSD05M-1A-GBD4-70L-C	
b) Double Solenoid Detented	<u>Vickers (by Danfoss)</u> DG4V4-012N-M-PM4WL-D7-H-4-10-S607  <u>Bosch-Rexroth</u> 4WE10D4X/OFCG24N9DK35L=AN  <u>Continental</u> VSD05M-2A-GBD4-70L-C	



Component	Requirements	Examples
c) Double Solenoid Spring Center Float Spool A&B to T	NOTE: Blocked center is not permitted.  <u>Vickers (by Danfoss)</u> DG4V4-016C-M-PM4WL-D7-H-4-10-S607  <u>Bosch-Rexroth</u> 4WE10J4X/CG24N9DK35L=AN  <u>Continental</u> VSD05M-3F-GBD4-70L-C	
d) Valves with Monitored Spool Positions for Safety Applications  Safety Manifold, BSPP w/M6x1 Metric Bolt	<u>ATOS</u> DKE-1631/2/A/FV-X24VDC 36W 1NO/1NC Monitoring contact  <u>MED-KAS</u> 29903  <u>Continental</u> IC-0502-XXX-D-M-1317	
e) Proportional	NOTE: Euro or integral cards only  <u>Vickers (by Danfoss)</u> K(B)SDG4V-3, 1* Series KBSDG4V-5, 1* Series  <u>Bosch-Rexroth</u> 4WREE 4WRKE  <u>Continental</u> VED03M PowerFlow Series	
f) Two / Three-Way, In-Line	NOTE: Requires the Fluid Power Engineer's prior approval.  <u>Vickers (by Danfoss)</u> SV1-10-C-3G-24DG (2-way) SV1-10-3-3G-24DG (3-way)  <u>Bosch-Rexroth</u> VEPS KKDSR1  <u>Continental</u> CEMDV-1*-C5-B-M12  <u>Oilgear</u> High Flow Applications	
6. Flow Control and Needle		
a) Standard Adjustable	<u>DMIC</u> FC1H-****B  <u>Parker</u> 9F****S, 9N****S	
b) Compensated	<u>Vickers (by Danfoss)</u> FCG-03-28-22-S10  <u>Continental</u> F12M-***-G-F	

Component	Requirements	Examples
c) Proportional	<p><b>NOTE: Requires the Fluid Power Engineer's prior approval.</b></p> <p><u>Bosch-Rexroth</u> <u>Vickers (by Danfoss)</u> <u>Continental</u></p>	
7. Modular, Stacking	<p><b>NOTE: Steel bodies only</b></p> <p><u>Bosch-Rexroth</u> <u>Vickers (by Danfoss)</u> <u>Continental</u> PowerFlow Series</p>	
a) Pressure Reducing / Relieving	<p><u>Bosch-Rexroth</u> D03 (P-port) ZDR6DP2-4X/25YM/12                      362 PSI / 25 BAR ZDR6DP2-4X/75YM/12                      1087 PSI / 75 BAR ZDR6DP2-4X/150YM/12                    2175 PSI / 150 BAR ZDR6DP2-4X/210YM/12                   3045 PSI / 210 BAR</p> <p>D05 (P-port) ZDR10DP2-5X/25YM/12                    362 PSI / 25 BAR ZDR10DP2-5X/75YM/12                    1087 PSI / 75 BAR ZDR10DP2-5X/150YM/12                   2175 PSI / 150 BAR ZDR10DP2-5X/210YM/12                   3045 PSI / 210 BAR</p> <p><u>Vickers (by Danfoss)</u> <u>Continental</u> PowerFlow Series</p>	
b) Relief	<p><u>Bosch-Rexroth</u> D03 (P to T) ZDB6VP2-4X/100V                      1450 PSI / 100 BAR ZDB6VP2-4X/200V                      2900 PSI / 200 BAR</p> <p>D05 (P to T) ZDB10VP2-4X/100V                      1450 PSI / 100 BAR ZDB10VP2-4X/200V                      2900 PSI / 200 BAR</p> <p><u>Vickers (by Danfoss)</u> <u>Continental</u> PowerFlow Series</p>	
c) Flow Control	<p><u>Bosch-Rexroth</u> D03 Z2FS6-2-4X/2QV, (A and B - Meter-in or out)</p> <p>D05 Z2FS10-5-3X/V, (A and B - Meter-in or out)</p> <p><u>Vickers (by Danfoss)</u> <u>Continental</u> PowerFlow Series</p>	
d) Pilot Operated Check	<p><u>Bosch-Rexroth</u> D03 Z2S6-1-6X/V, (A and B line)</p> <p>D05 Z2S10-1-3X/V, (A and B line)</p> <p><u>Vickers (by Danfoss)</u> <u>Continental</u> <u>Command Controls</u></p>	

Component	Requirements	Examples
8. In-Line Relief	<u>Bosch-Rexroth</u> <u>Vickers (by Danfoss)</u> <u>Continental</u> <u>Command Controls</u>	
9. Servo	NOTE: Requires the Fluid Power Engineer's prior approval.  <u>Bosch Rexroth</u>  <u>Vickers (by Danfoss)</u> SM4 series  <u>Moog</u> 72 or 78 Series	
G. Power Units (flooded inlet only)		
1. Compact ((3) Actuators or less only)	Must conform to ISO 4413, 8.2 and SD-013, Hydraulic Addendum.  Reference GM1720(LS1) and GM1721(LS2) for hydraulic design and fluid requirements. Contact the Nexteer Controls Engineer for further assistance with obtaining the Nexteer SSG lubrication number. Most Power units and pumps will use SSG-111A which is an ISO-46 hydraulic oil.	Shaltz Fluid Power Signature Series SD*****SS or Equivalent.  Contact Controls Engineer for other options.
2. Compact - Energy Savings	NOTE: Incoming Power must be 200 – 220VAC  <u>Daikin</u> EHU3007-40-N-902-N      8 GPM / 1000 PSI      CE-Self SUT06D4016-30-01-N      10 GPM / 2300 PSI      CE-Self SUT10D6021-30-01-N      16 GPM / 3000 PSI      CE-Self SUT10D8021-30-01-N      22 GPM / 3000 PSI      CE-Self (N = Air Filter installed)	Programming cable CCS230-EHR7-1M and Hybrid_Win programming software are required for each Daikin unit. Program is to be backed up and submitted to Nexteer Controls Engineer
3. Hydrostatic	NOTE: Requires the Fluid Power Engineer's prior approval.	
4. Standard	NOTE: Requires the Fluid Power Engineer's prior approval.  ISO-4413, 8.2 SD-013, Hydraulic Addendum	Shaltz Fluid Power Overhead Series, SD6*****SS or Equivalent  Contact Controls Engineer for other options.
H. Pumps	NOTE: All pumps to meet SAE Mounting requirements.	
1. External Gear	<u>Parker</u>  <u>DMIC</u> DPG  <u>Bosch-Rexroth</u> AZP	

Component	Requirements	Examples
2. Piston – Axial	<p><u>Bosch-Rexroth</u> AA10VSO18DRG/31RVKC62N00      8GPM      R902502752</p> <p><u>Oilgear PVWJ A-FRAME</u> PVWJ-011-A1UV-RSAY-P-LNNNN      4 GPM PVWJ-011-A1UV-RSAY-P-1NNNN      4 GPM PVWJ-014-A1UV-RSAY-P-LNNNN      6 GPM PVWJ-014-A1UV-RSAY-P-1NNNN      6 GPM PVWJ-022-A1UV-RSAY-P-LNNNN      10 GPM PVWJ-022-A1UV-RSAY-P-1NNNN      10 GPM</p> <p><u>Bosch-Rexroth</u> AA10VSO45DR/31RVKC62N00      20 GPM      R902502741</p> <p><u>Oilgear PVWJ B-FRAME</u> PVWJ-025-A1UV-RSFY-P-LNNNN      11 GPM PVWJ-025-A1UV-RSFY-P-1NNNN      11 GPM PVWJ-034-A1UV-RSFY-P-LNNNN      15 GPM PVWJ-034-A1UV-RSFY-P-1NNNN      15 GPM PVWJ-046-A1UV-RSFY-P-LNNNN      20 GPM PVWJ-046-A1UV-RSFY-P-1NNNN      20 GPM</p> <p><u>Bosch-Rexroth</u> AA10VSO71DR/31RVKC92N00      32 GPM      R902502701</p> <p><u>Oilgear PVWJ C-FRAME</u> PVWJ-064-A1UV-RSFY-P-LNNNN      25 GPM PVWJ-064-A1UV-RSFY-P-1NNNN      25 GPM PVWJ-076-A1UV-RSFY-P-LNNNN      34 GPM PVWJ-076-A1UV-RSFY-P-1NNNN      34 GPM</p> <p><u>Bosch-Rexroth</u> AA10VSO100DR/31RVKC62N00      45 GPM      R902502997</p> <p><u>Oilgear (C-Frame)</u> PVWJ-098-A1UV-RSFY-P-LNNNN      45 GPM PVWJ-098-A1UV-RSFY-P-1NNNN      45 GPM</p> <p><u>Bosch-Rexroth</u> AA10VSO140DR/31RVKD62N00      63 GPM      R902503003</p> <p><u>Oilgear (C-Frame)</u> PVWJ-130-A1UV-RSFY-P-LNNNN      60 GPM PVWJ-130-A1UV-RSFY-P-1NNNN      60 GPM</p> <p><u>Vickers (by Danfoss)</u> PVM</p> <p>NOTE: PVM requires the Fluid Power Engineer's prior approval.</p>	
3. Screw	<u>IMO</u>	
4. Vane	<u>Bosch-Rexroth</u> VPV	
a) Fixed Delivery	<u>Vickers (by Danfoss)</u> V and VMQ Industrial	
b) Variable Delivery	NOTE: PVX is the same as Bosch-Rexroth VPV series and is made by Continental, private labeled by B-R.  2 Stage, remote pressure control capable, with flange ports.	
1) 7 GPM @ 1800 RPM (325 – 3000 PSI)	<p><u>Bosch-Rexroth</u> 0513R18C3 VPV16SM21HYB03</p> <p><u>Continental</u> PVX-8B-30-RF-P-1S-17-A/-BSPP</p>	

Component	Requirements	Examples
2) 11 GPM @ 1800 RPM (325 – 3000 PSI)	<u>Bosch-Rexroth</u> 0513R18C3VPV25SM21HYB0B04  <u>Continental</u> PVX-11B-30-RF-P-1S-17-A/-BSPP	
3) 15 GPM @ 1800 RPM (325 – 3000 PSI)	<u>Bosch-Rexroth</u> 0513R18C3VPV32SM21HYB0B04  <u>Continental</u> PVX-15B-30-RF-P-1S-17-A/-BSPP	
4) 20 GPM @ 1800 RPM (325 – 3000 PSI)	<u>Bosch-Rexroth</u> 0513R18C3 VPV63SM21HYB05  <u>Continental</u> PVX-20B-30-RF-P-5S-17-A /-BSPP	
5) 29 GPM @ 1800 RPM (325 – 3000 PSI)	<u>Bosch-Rexroth</u> 0513R18C3VPV45SM21HYB0B05  <u>Continental</u> PVX-29B-30-RF-P-5S-17-A /-BSPP	
6) 36 GPM @ 1800 RPM (325 – 3000 PSI)	<u>Bosch-Rexroth</u> 0513R18C3 VPV80SM21HYB05  <u>Continental</u> PVX-36B-30-RF-P-5S-17-A /-BSPP	
7) 46 GPM @ 1800 RPM (325 – 3000 PSI)	<u>Bosch-Rexroth</u> 0513R18C3 VPV100SM21HYB04  <u>Continental</u> PVX-46B-25-RF-P-5S-17-A /-BSPP	
8) 60 GPM @ 1800 RPM (325 – 3000 PSI)	<u>Bosch-Rexroth</u> 0513R18C3 VPV130SM21HYB04  <u>Continental</u> PVX-60B-25-RF-P-5S-17-A /-BSPP	
9) 75 GPM @ 1800 RPM (325 – 3000 PSI)	<u>Bosch-Rexroth</u> 0513R18C3 VPV164SM21HYB04  <u>Continental</u> PVX-75B-25-RF-P-5S-17-A /-BSPP	

## 6. Lubrication Components

The "Component" column is organized by component type. Nexteer Automotive does not have requirements for technologies not listed.

The "Requirements" column has two functions:

- 1) Where component brand or part numbers are designated, this is the Nexteer Automotive approved (required) component.
  - Where multiple brands or part numbers are listed, OEM's are allowed to select the one that provides the best value. Components are not listed in any preferred order.
- 2) Where specifications are provided, components are required to meet these specifications.

NOTE: To identify regional requirements, the following notations are used: (B) - Brazil; (C) - China; (I) - India; (E) - Europe & Morocco; and (NA) - North America. If not specifically noted with region letter designation, any of the designated components may be used.

The "Examples" column lists components that meet the requirements listed in the "Requirements" column. The example components are not required.

NOTE: All threaded pressurized fittings shall be BSPP (G) thread. Tube or hose connections shall be O-ring face seal only.

NOTE: Changes since the last revision are highlighted

Component	Requirements	Examples
Machine Lubrication		
A. Accessories		
1. Regulator (Mastic)	<div><div><div><div><div><u>GP Reeves</u></div><div>MPR-3500-250-D-F-H</div><div>MPR-3500-500-D-F-H</div><div>NOTE: Grease only. Not for use with RTV or material with Teflon.</div></div><div><div>Max Inlet P.</div><div>3500 PSI</div><div>3500 PSI</div><div></div></div><div><div>Outlet Pressure</div><div>0-250 PSI</div><div>0-500 PSI</div><div></div></div><div><div></div><div>1/4 NPT</div><div>1/4 NPT</div><div></div></div></div></div><div><div><div>GPR5000-1250-200</div><div>GPR5000-3000-450</div><div>GPR5000-3000-1250</div><div>GPR5000-6000-3000</div><div>GPR5000-6000-1000</div><div>GPR5000-6000-2500</div><div>NOTE: For high flow and thick materials, including Teflon based materials.</div></div><div><div><u>ARO</u></div><div>651780-A1A-B</div><div>651780-A1B-B</div><div>651780-C1B-B</div><div>NOTE: Use C1B for high flow and thick materials</div></div><div><div><u>Dopag (piston)</u></div><div>Large Body (ID12)</div><div>450.00.11</div><div>450.00.12</div><div>Medium Body (ID8)</div><div>450.00.10</div><div>Small Body (ID4)</div><div>450.00.00</div><div>NOTE: Use for grease, oil, 1K and 2K silicone applications.</div></div><div><div><u>Dopag (diaphragm)</u></div><div>402.25.30</div><div>402.25.60</div><div>400.26.56</div><div>NOTE: Use for adhesive, sealant, and abrasive applications.</div></div></div></div>	
2. High pressure flexible lines for lubrication applications	<div><div><div><div><u>Parker</u></div><div>NN4X.65 (4mm OD nylon tube) 300 PSI</div><div>NN6X1 (6mm OD nylon tube) 341 PSI</div><div>With brass compression fittings</div></div><div><div><u>Graco</u></div><div>17S55* (6mm OD Nylon Tube) 1000 PSI</div><div>with 17R56* BSPT Fittings</div></div></div></div>	

Component	Requirements				Examples
3. Relief	<u>Graco (grease)</u>				
	(750 PSI)	563163			
	(1000 PSI)	563164			
	(1250 PSI)	563165			
	(1500 PSI)	563166			
	(2000 PSI)	563167			
	(2500 PSI)	563168			
	(3000 PSI)	563169			
	<u>Graco (air)</u>				
	(50 PSI)	214691			
4. Block Cycle Indicator (M12)	<u>Graco</u>				
	17L983				
5. Pressure Switch	<u>Graco</u>				
	P1=557829				
B. Lubrication System	<u>Graco</u>				
	MPP-T*-BSPP-A3-G3-L*-P1 MPP-GP*-BSPP-A3-G3-L*-P1				
C. Pumps	<u>Graco</u>				
	ALS-25M 563306 with BSPP base plate 563357				
E. Divider Values	<u>Graco</u>				
	MSP Series (BSPP connections only)				
F. Filters					
1. Breather	<u>Facet</u>				
	569022-01				
	<u>Gitz</u>				
	1633-037801				
2. Fill Filter Assembly (Oil)	<u>Hydrocraft</u>				
	HCBP-8				
	<u>Graco</u>				
	563095                      10m				
3. Line Filter					
	a) Low Pressure (Oil)	<u>Graco</u>			
		563095                      10m                      200 PSI                      3/4 NPT			
	563093 (element)				
	b) High Pressure (Oil) Spin On	<u>Graco</u>			
		564004                      10m                      3000 PSI                      G3/4			
556031 (element)					
c) High Pressure (Oil) Block	<u>Graco</u>				
	563516                      10m                      7500 PSI                      G1/4				
563509 (element)					
d) High Pressure (Grease) Block Strainer	<u>Graco</u>				
	564406                      149m                      7500 PSI                      G1/4				
557700 (element)					

Component	Requirements	Examples																																																
Product Lubrication																																																		
A. Accessories																																																		
1. Tooling Shutoff / Anti-Drool Valve (pneumatically actuated)	<u>GP Reeves</u> DV2973A																																																	
2. Flow Switch / Flow Meter	NOTE: Material Application Chart (MAC) determines if required.																																																	
a) In-Line	<u>GP Reeves</u> <table> <tr> <th></th><th></th><th><u>Max Pressure</u></th></tr> <tr> <td>FS3009-2</td><td>(0.2-4 cc/sec)</td><td>1000 PSI 1/8 NPT</td></tr> <tr> <td>FS3009-4</td><td>(0.2-6 cc/sec)</td><td>1000 PSI 1/4 NPT</td></tr> <tr> <td>FS3002</td><td>(0.1-20 cc/sec)</td><td>3000 PSI</td></tr> </table>			<u>Max Pressure</u>	FS3009-2	(0.2-4 cc/sec)	1000 PSI 1/8 NPT	FS3009-4	(0.2-6 cc/sec)	1000 PSI 1/4 NPT	FS3002	(0.1-20 cc/sec)	3000 PSI																																					
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FS3009-4	(0.2-6 cc/sec)	1000 PSI 1/4 NPT																																																
FS3002	(0.1-20 cc/sec)	3000 PSI																																																
b) Clamp-On																																																		
1) Conductor - Plastic/Nylon																																																		
a) O.D. - 3.0mm, 3.18mm (1/8"), or 4mm	<u>Keyence</u> FD-XC1R* (clamp set) FD-XS1 (sensor head) FD-XA1 (IO-Link controller)																																																	
b) O.D. - 6.0mm, 3.35mm (1/4"), or 8mm	<u>Keyence</u> FD-XC8R* (clamp set) FD-XS8 (sensor head) FD-XA1 (IO-Link controller)																																																	
2) Conductor - Metal / Steel Tubing																																																		
a) O.D. - 3.0mm, 3.18mm (1/8"), or 4mm	<u>Keyence</u> FD-XC1M (clamp set) FD-XS1 (sensor head) FD-XA1 (IO-Link controller)																																																	
b) O.D. - 6.0mm, 3.35mm (1/4"), or 8mm	<u>Keyence</u> FD-XC8M (clamp set) FD-XS8 (sensor head) FD-XA1 (IO-Link controller)																																																	
3. Regulator (Mastic)	<u>GP Reeves</u> <table> <tr> <th></th><th><u>Max Inlet P.</u></th><th><u>Outlet Pressure</u></th></tr> <tr> <td>MPR-3500-250-D-F-H</td><td>3500 PSI</td><td>0-250 PSI 1/4 NPT</td></tr> <tr> <td>MPR-3500-500-D-F-H</td><td>3500 PSI</td><td>0-500 PSI 1/4 NPT</td></tr> </table> NOTE: Grease only. Not for use with RTV or material with Teflon.  <table> <tr> <td>GPR5000-1250-200</td><td>1250 PSI</td><td>30-200 PSI 3/8 NPT</td></tr> <tr> <td>GPR5000-3000-450</td><td>3000 PSI</td><td>75-450 PSI 3/8 NPT</td></tr> <tr> <td>GPR5000-3000-1250</td><td>3000 PSI</td><td>400-1250 PSI 3/8 NPT</td></tr> <tr> <td>GPR5000-6000-3000</td><td>6000 PSI</td><td>1000-3000 PSI 3/8 NPT</td></tr> <tr> <td>GPR5000-6000-1000</td><td>6000 PSI</td><td>175-1000 PSI 3/8 NPT</td></tr> <tr> <td>GPR5000-6000-2500</td><td>6000 PSI</td><td>750-2500 PSI 3/4 NPT</td></tr> </table> NOTE: For high flow and thick materials, including Teflon based materials.  <u>ARO</u> <table> <tr> <td>651780-A1A-B</td><td>3000 PSI</td><td>400-1250 PSI 3/8 NPT</td></tr> <tr> <td>651780-A1B-B</td><td>6000 PSI</td><td>1000-3000 PSI 3/8 NPT</td></tr> <tr> <td>651780-C1B-B</td><td>6000 PSI</td><td>750-2500 PSI 3/4 NPT</td></tr> </table> NOTE: Use C1B for high flow and thick materials  <u>Dopag (piston)</u> Large Body (ID12) <table> <tr> <td>450.00.11</td><td>3625 PSI</td><td>87-725 PSI G1/2</td></tr> <tr> <td>450.00.12</td><td>3625 PSI</td><td>217-2175 PSI G1/2</td></tr> </table> Medium Body (ID8) <table> <tr> <td>450.00.10</td><td>3625 PSI</td><td>87-725 PSI G3/8</td></tr> </table> Small Body (ID4) <table> <tr> <td>450.00.00</td><td>3625 PSI</td><td>87-725 PSI G1/4</td></tr> </table> NOTE: Use for grease, oil, 1K and 2K silicone applications.		<u>Max Inlet P.</u>	<u>Outlet Pressure</u>	MPR-3500-250-D-F-H	3500 PSI	0-250 PSI 1/4 NPT	MPR-3500-500-D-F-H	3500 PSI	0-500 PSI 1/4 NPT	GPR5000-1250-200	1250 PSI	30-200 PSI 3/8 NPT	GPR5000-3000-450	3000 PSI	75-450 PSI 3/8 NPT	GPR5000-3000-1250	3000 PSI	400-1250 PSI 3/8 NPT	GPR5000-6000-3000	6000 PSI	1000-3000 PSI 3/8 NPT	GPR5000-6000-1000	6000 PSI	175-1000 PSI 3/8 NPT	GPR5000-6000-2500	6000 PSI	750-2500 PSI 3/4 NPT	651780-A1A-B	3000 PSI	400-1250 PSI 3/8 NPT	651780-A1B-B	6000 PSI	1000-3000 PSI 3/8 NPT	651780-C1B-B	6000 PSI	750-2500 PSI 3/4 NPT	450.00.11	3625 PSI	87-725 PSI G1/2	450.00.12	3625 PSI	217-2175 PSI G1/2	450.00.10	3625 PSI	87-725 PSI G3/8	450.00.00	3625 PSI	87-725 PSI G1/4	
	<u>Max Inlet P.</u>	<u>Outlet Pressure</u>																																																
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GPR5000-1250-200	1250 PSI	30-200 PSI 3/8 NPT																																																
GPR5000-3000-450	3000 PSI	75-450 PSI 3/8 NPT																																																
GPR5000-3000-1250	3000 PSI	400-1250 PSI 3/8 NPT																																																
GPR5000-6000-3000	6000 PSI	1000-3000 PSI 3/8 NPT																																																
GPR5000-6000-1000	6000 PSI	175-1000 PSI 3/8 NPT																																																
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Revision 16DE24

Component	Requirements	Examples												
b) 420 micron, 40 mesh	<p><u>GP Reeves</u></p> <table> <tr> <td>GF1420-4</td><td>3000 PSI</td><td>1/4 NPT</td></tr> <tr> <td>GF1420-6</td><td>3000 PSI</td><td>3/8 NPT</td></tr> <tr> <td>GF1420-8</td><td>3000 PSI</td><td>1/2 NPT</td></tr> <tr> <td>GF1420M-12</td><td>3000 PSI</td><td>3/4 NPT</td></tr> </table> <p>KA10394A (element)</p> <p><b>NOTE: Thread adapters required to use NPT strainers.</b></p>	GF1420-4	3000 PSI	1/4 NPT	GF1420-6	3000 PSI	3/8 NPT	GF1420-8	3000 PSI	1/2 NPT	GF1420M-12	3000 PSI	3/4 NPT	
GF1420-4	3000 PSI	1/4 NPT												
GF1420-6	3000 PSI	3/8 NPT												
GF1420-8	3000 PSI	1/2 NPT												
GF1420M-12	3000 PSI	3/4 NPT												
<p><b>B. Pump Supply System</b></p> <p>NOTE: Every effort shall be made to install the barrel pumps as close to the dispense point as possible. 45 and 90 degree fittings are not permitted in the supply line between the pump outlet and dispenser inlet.</p> <p>NOTE: Grease pressures shall be limited to a maximum of 3000 PSI.</p> <p><b>NOTE: Double barrel pumps require the Fluid Power Engineer's prior approval.</b></p>	<p><u>Graco</u></p> <p>Contact Fluid Power Engineer for acceptable pump part numbers.</p> <p><u>PVA (Gap Fill applications)</u></p> <p>PVA-1GPU PVA-5GPU</p> <p><u>GP Reeves (NA)</u></p> <p>Each GP Reeves pump option includes the items below. Additional items maybe included. See pump options below for clarification.</p> <ul style="list-style-type: none"> <li>- Control panel</li> <li>- Stack light</li> <li>- Low level and empty sensors</li> <li>- ISO solenoid valve for pump ON/OFF control</li> <li>- ISO solenoid valve for ram ON/OFF control</li> <li>- ISO solenoid valve for depressurization (relief)</li> <li>- 35-minute idle timer</li> </ul> <p>Pump motor</p> <ul style="list-style-type: none"> <li>- Samoa 20:1 (chop-check) pump option for Lithium and Calcium based materials. For use in all locations except China.</li> <li>- ARO 22:1 (chop-check) pump for separation prone materials such as RTV and Teflon based. For use in all locations. Use for Lithium and Calcium based materials for China.</li> <li>- ARO 43:1 (chop-check) pump for thicker materials such as Crevseal and RTV. For use in all locations.</li> </ul> <p><u>Option 40NX</u></p> <p>Used to supply single machines.</p> <p><u>Option 73NX</u></p> <p>Same as the Option 40NX, but also includes the items below to gain JFK lot tracking with a single connected machine. Includes:</p> <ul style="list-style-type: none"> <li>- Ethernet switch</li> <li>- Cognex Scanner</li> </ul> <p><u>Option 41NX</u></p> <p>Used to supply multiple machines when in close proximity to the pump. Includes:</p> <ul style="list-style-type: none"> <li>- PLC</li> <li>- Ethernet switch</li> </ul> <p><u>Option 74NX</u></p> <p>Same as the Option 41NX, but also includes the items below to gain JFK lot tracking with multiple connected machines. Includes:</p> <ul style="list-style-type: none"> <li>- PLC</li> <li>- Ethernet switch</li> <li>- Cognex Scanner</li> </ul>													
1. Container Size	<p><b>NOTE: The following barrel sizes require the Fluid Power Engineer's prior approval.</b></p> <ul style="list-style-type: none"> <li>- 6 Gallon (16L)</li> <li>- 8 Gallon (30L)</li> <li>- 16 Gallon (60L)</li> <li>- 30 Gallon (115L)</li> </ul>													

Component	Requirements				Examples
<p>a) 55 Gallon Barrel</p> <p>NOTE: Add "-CE" to end of model number to include CE Approval, labeling, and documentation. (example: GDP20-400I2-40NX-CE)</p> <p>NOTE: 6 inch ram cylinders require the Fluid Power Engineer's prior approval.</p> <p>NOTE: Not advised to supply multiple machines with Crevseal because of its thick consistency requiring excessive pressure requirements.</p>	<u>Option 40NX</u>		<u>Max Flow</u>	<u>Max Output Pressure</u>	
	GDP20-400I2-40NX	Samoa 20:1	2100 cc/min	3000 PSI @ 150 PSI air	
	GDP22-400I2-40NX	ARO 22:1	1500 cc/min	2200 PSI @ 100 PSI air	
	GDP43-400I2-40NX	ARO 43:1	2800 cc/min	4300 PSI @ 100 PSI air	
	<u>Option 41NX</u>				
	GDP20-400I2-41NX	Samoa 20:1	2100 cc/min	3000 PSI @ 150 PSI air	
	GDP22-400I2-41NX	ARO 22:1	1500 cc/min	2200 PSI @ 100 PSI air	
	GDP43-400I2-41NX	ARO 43:1	2800 cc/min	4300 PSI @ 100 PSI air	
	<u>Option 73NX</u>				
	GDP20-400I2-73NX	Samoa 20:1	2100 cc/min	3000 PSI @ 150 PSI air	
	GDP22-400I2-73NX	ARO 22:1	1500 cc/min	2200 PSI @ 100 PSI air	
	GDP43-400I2-73NX	ARO 43:1	2800 cc/min	4300 PSI @ 100 PSI air	
	<u>Option 74NX</u>				
	GDP20-400I2-74NX	Samoa 20:1	2100 cc/min	3000 PSI @ 150 PSI air	
	GDP22-400I2-74NX	ARO 22:1	1500 cc/min	2200 PSI @ 100 PSI air	
	GDP43-400I2-74NX	ARO 43:1	2800 cc/min	4300 PSI @ 100 PSI air	
<p>b) 5 Gallon Pail</p> <p>NOTE: Add "-CE" to end of model number to include CE Approval, labeling, and documentation. (example: GSP20-35IbA-40NX-CE)</p> <p>NOTE: Not advised to supply multiple machines with 5 Gallon bucket pump.</p>	<u>Option 40NX</u>		<u>Max Flow</u>	<u>Max Output Pressure</u>	
	GSP20-35IbA-40NX	Samoa 20:1	2100 cc/min	3000 PSI @ 150 PSI air	
	GSP22-35IbA-40NX	ARO 22:1	1500 cc/min	2200 PSI @ 100 PSI air	
	<u>Option 73NX</u>				
	GSP20-35IbA-73NX	Samoa 20:1	2100 cc/min	3000 PSI @ 150 PSI air	
	GSP22-35IbA-73NX	ARO 22:1	1500 cc/min	2200 PSI @ 100 PSI air	

Component	Requirements	Examples																									
C. Dispensers	NOTE: Filled and dispensed position sensors are required on all Dopag and GP Reeves GPMD dispensers.																										
1. Grease																											
a) Dispense Type																											
1) Glob, Dab or Shot	<div><div><u>GP Reeves</u></div><div>GPMD3000-.60 -02-030.05 - 0.60 cc600-3000 PSI</div><div>GPMD3000-2-02-030.15 - 2.0 cc400-3000 PSI</div><div>GPMD3000-9-02-030.35 - 9 cc400-3000 PSI</div><div>GPMD3000-20-02-035 - 20 cc400-3000 PSI</div></div> <div><u>Inlet Range</u></div> <div>NOTE: 10000 Series dispensers are not permitted.</div> <div><table><thead><tr><th><u>Dopag</u></th><th></th><th><u>Max Inlet</u></th><th><u>Inlet</u></th><th><u>Outlet</u></th></tr></thead><tbody><tr><td>450.20.03</td><td>0.003 - 0.2mL</td><td>725 PSI</td><td>G1/4</td><td></td></tr></tbody></table><div>NOTE: Does not have suckback feature as other Dopag part numbers below. To prevent drooling, extended outlet tubing is not allowed. Directly mount dispenser outlet to tooling or use outlet nozzles only.</div><table><tbody><tr><td>1029662 (replaced 450.10.06)</td><td>0.05 - 0.5mL</td><td>1160 PSI</td><td>G1/8</td><td></td></tr><tr><td>1023208 (replaced 450.10.07)</td><td>0.1 - 3.0mL</td><td>1160 PSI</td><td>G1/8</td><td>G1/8</td></tr><tr><td>415.12.21</td><td>0.5 - 12mL</td><td>2175 PSI</td><td>G1/8</td><td></td></tr></tbody></table></div>	<u>Dopag</u>		<u>Max Inlet</u>	<u>Inlet</u>	<u>Outlet</u>	450.20.03	0.003 - 0.2mL	725 PSI	G1/4		1029662 (replaced 450.10.06)	0.05 - 0.5mL	1160 PSI	G1/8		1023208 (replaced 450.10.07)	0.1 - 3.0mL	1160 PSI	G1/8	G1/8	415.12.21	0.5 - 12mL	2175 PSI	G1/8		
<u>Dopag</u>		<u>Max Inlet</u>	<u>Inlet</u>	<u>Outlet</u>																							
450.20.03	0.003 - 0.2mL	725 PSI	G1/4																								
1029662 (replaced 450.10.06)	0.05 - 0.5mL	1160 PSI	G1/8																								
1023208 (replaced 450.10.07)	0.1 - 3.0mL	1160 PSI	G1/8	G1/8																							
415.12.21	0.5 - 12mL	2175 PSI	G1/8																								
2) Bead	<div><u>Dopag</u><div>Dopag dispensers listed above shall supply material to the inlet of an additional 401.*** dispenser. Dual regulators are also required upstream of the dispenser.</div></div> <div><u>Viscotec</u><div>viproPUMP100 VisLas (proPUMP_7)</div><div>B-KC-Viscopro-C (controller, includes 5m cable)</div></div>																										
3) Spray, Stream	<div>GP Reeves</div> <div>Walther</div> <div>Dopag</div>																										
b) Air Detection (compression check)	NOTE: High severity products where a flow or pressure switch may not be adequate to detect air in the material properly may require a compression test for air content prior to the dispense to ensure the correct amount is delivered to the product. Refer to the Material Application Chart (MAC) and discuss this with the purchasing ME to determine if this will be a requirement. For those applications, these products shall be considered.																										
1) Single Dispenser	<div><u>Glob, Dab or Shot</u><div><u>GP Reeves</u><div>AA1 (pneumatic)</div></div></div> <div><u>Bead</u><div><u>GP Reeves</u><div>AA8 (servo)</div></div></div>																										
2) Multiple Dispensers	<div>NOTE: Where a compression test is required ahead of multiple dispensers of any type, the following products shall be considered. Options are to be discussed and calculations approved prior to placing any orders.</div> <div><u>Standalone Detection Package</u><div>NOTE: To be implemented along with a separate SD-007 approved barrel pump from Section B. Select an SD-007 approved PLC and PNP sensors.</div><div><u>GP Reeves</u><div>GUS *****-ST-CT8-DIP</div><div>GUS *****-FL-CT8-DIP</div></div></div> <div><u>Pump with Detection Package (GUS)</u><div>NOTE: Pump is to be chosen from SD-007 even though part of GUS package. This system to be implemented with a separate SD-007 approved PLC, PNP sensors, and auto-depressurization.</div><div><u>GP Reeves</u><div>SP20_35A6-GUS*****-FL2-CT8-DIP</div><div>SP22_35A6-GUS*****-FL2-CT8-DIP</div></div></div>																										

Component	Requirements	Examples
2. RTV		
a) Dispense Type		
1) Glob, Dab, or Shot	<div><div><div><div><div><u>Dopag</u></div><div>450.20.03</div></div><div><div>0.003 – 0.2 mL</div><div>725 PSI</div></div><div><div><u>Max Inlet</u></div><div>G1/4</div></div></div><div>NOTE: Does not have suckback feature as other Dopag part numbers below. To prevent drooling, extended outlet tubing is not allowed. Directly mount dispenser outlet to tooling or use outlet nozzles only.</div><div><div><div>1029662 (replaced 450.10.06)</div><div>0.05 – 0.5 mL</div><div>1160 PSI</div><div>G1/8</div></div><div><div>1023208 (replaced 450.10.07)</div><div>0.1 – 3.0 mL</div><div>1160 PSI</div><div>G1/8</div></div><div><div>415.12.21</div><div>0.5 – 12 mL</div><div>2175 PSI</div><div>G1/8</div></div></div><div><div><u>PVA</u></div><div>SB400-C</div></div></div></div>	
2) Bead		
a) Machine Mounted	<div><div>XYZ Mounting</div><div><div><u>Dopag</u></div><div>Dopag dispensers listed above shall supply material to the inlet of an additional 401.***.*** dispenser. Dual regulators are also required upstream of the dispenser.</div><div><div><u>PVA</u></div><div>SB400-C</div></div></div></div>	
b) Robot Mounted	<div><div><div><u>PVA</u></div><div>RMP-SB400-C</div><div>CONT-RMP-54 (controller)</div><div>NOTE: IP54 rated controller only.</div><div>NOTE: G-Series, 10-gauge x 3" needle is recommended</div></div><div><div><u>Viscotec</u></div><div>viproPUMP100 VisLas (viproPUMP_7)</div><div>B-KC-Viscopro-C (controller, includes 5m cable)</div></div></div>	
3) Gap Fill		
a) Single Component (1K)	<div><div><div><u>PVA</u></div><div>SB400-C</div></div></div>	
b) Two Component (2K)	<div><div><div><div><u>Scheugenpflug</u></div><div>Process Module Dispensing (process unit)</div><div>Fluid Delivery, Pailfeed</div><div>PF803-2C</div><div>PFA803-2C (abrasive materials) (replaced A280)</div><div>Dispenser</div><div>Dos P016-2C</div></div></div></div>	

## 7. Machine Electrical Controls Components

The "Component" column is organized by component type. Nexteer Automotive does not have requirements for technologies not listed.

The "Requirements" column has two functions:

- 1) Where component brand or part numbers are designated, this is the Nexteer Automotive approved (required) component.
  - Where multiple brands or part numbers are listed, OEM's are allowed to select the one that provides the best value. Components are not listed in any preferred order.
- 2) Where specifications are provided, components are required to meet these specifications.

NOTE: To identify regional requirements, the following notations are used: (B) - Brazil; (C) - China; (I) - India; (E) - Europe & Morocco; and (NA) - North America. If not specifically noted with region letter designation, any of the designated components may be used.

The "Examples" column lists components that meet the requirements listed in the "Requirements" column. The example components are not required.

NOTE: Changes since the last revision are highlighted

Component	Requirements	Examples
<b>A. Circuit Breakers</b>		
1. Molder Case Circuit Breaker  NOTE: Typically used for 480VAC / 380VAC	IEC 60947-2 CE CCC IP2X Minimum (C) C Trip Curve - Shall be used unless otherwise noted by device manufacturer D Trip Curve - Shall be used on primary side of transformers and Servo Drives unless otherwise noted by device manufacturer.	Allen-Bradley 140UT-D Series (0-30 A) 140G Series (10-3000 A)  Eaton E125H  Square D HRL36***U31X (15-100 A) JRL36***U31X (100-250 A) LRL36***U31X (250-600 A)
2. Miniature Circuit Breaker  NOTE: Typically used for 480VAC / 380VAC / 220VAC / 120VAC	IEC 60947-2 or UL489 CE CCC (C) DIN Rail Mount IP2X Minimum C Trip Curve - Shall be used unless otherwise noted by device manufacturer D Trip Curve - Shall be used on primary side of transformers unless otherwise noted by device manufacturer.	Allen-Bradley 1489-M*C*** 1489-M*D***  Eaton FAZ Series  Schneider Electric Multi 9 – C60 Series Acti 9 – iC65L Series (China preference)
3. Supplementary Protector  NOTE: Typically used for 24VDC	IEC 60947-2 or UL-1077 CE CCC (C) DIN Rail Mount IP2X Minimum C Trip Curve - Shall be used unless otherwise noted by device manufacturer D Trip Curve - Shall be used on primary side of transformers unless otherwise noted by device manufacturer.	Allen-Bradley 1492-SPM*C*** 1492-SPM*D***  Schneider Electric Multi 9 – C60 Series Acti 9 – C65N-DC Series (China preference)
4. Electronic Circuit Protection / Module / Breaker  NOTE: May only be used for devices requiring Class 2 power source.	EN 61000-6-2 CE DIN Rail Mount IP2X Minimum	Allen-Bradley 1694 Series  Puls PISA11-Series  Phoenix Contact PTCB E1 (2909909)
5. Residual Current Devices (RCD)  NOTE: For applications outside North America only. Additional branch circuit current limiting is required when utilizing an RCD.	EN 61008 CE CCC (C) IP2X Minimum Din Rail Mount 30mA Leakage Detection	Allen-Bradley 1492-RCD*A25  Schneider Electric Multi 9 - M9R11225 Acti 9 - A9R52225 (China preference)

Component	Requirements	Examples
B. Power Supplies 1. Switched Mode DC a) 1-Phase Power Supplies	PULS (C) CP** .241 QS** .241  Allen-Bradley Bulletin 1606 1606-XLE***E* 1606-XLS***E*	
	IFM DN40** E840**	
	b) 3-Phase Supplies  PULS (C) CT** .241 QT** .241  Allen-Bradley Bulletin 1606 1606-XLE***E* 1606-XLS***E*	
	IFM DN4*** E840**	
2. Uninterruptable Power Supply (UPS)	Requires USB connection to PC with configuration to command PC to shut down if power outage exceeds one minute. Minimum 5 minutes of battery backup power Audible Alarm Receptacles configured for country of destination	TrippLite INTERNET350U (120VAC) TrippLite AVR550U (220VAC)  APC SMART-UPS (China preference)
C. Drives (Variable Frequency)	Allen-Bradley PowerFlex 525 25B-D***N114 (380-480VAC 3ph, 0.5-30HP, internal line filtering)  PowerFlex 527 25C-D***N114 (380-480VAC 3ph, 0.5-30HP, internal line filtering)  PowerFlex 755 20G1*****0NNNNN (380-480VAC 3ph, 1.0-350HP) 20-750-S (Safe Torque Off Module) 20-HIM-A6 (Human Interface Module)  Bosch Rexroth EFC5610-***K**-3P4-MDA-7P-NNNNN-L1NN (0.4kW to 315kW) FEAM03.2-00*-NN-NNNN VFD Shield Connection	
D. Motion Control 1. Servo Drives	Allen-Bradley Kinetix 5500 2198-H0**-ERS (Three-phase input supply power only) 2198-DB**-F (AC Line Filter)  NOTE: If using a MPL motor, the following is required: 2198-H2DCK (DSL Converter Kit) 2090-CSBM1DF (Motor Power / Brake to meet 50C drive rating) 2090-CFBM7DF (Motor Feedback)  Kinetix 5700 2198-S***-ERS3 (Single Axis) 2198-D***-ERS3 (Dual Axis) 2198-DB**-F (AC Line Filter)	
	Bosch Rexroth HCS01 Servo Drives HMS01.1N-W0***-A-07-NNNN (Three-phase input supply power only) NFD03.1-480-*** (AC Line Filter)	
	HMS01 Single Axis Drive Inverters HMS01.1N-W0***-A-07-NNNN NFD03.1-480-*** (AC Line Filter)	
	HMD01 Double Axis Drive Inverters HMD01.1N-W00**-A-07-NNNN NFD03.1-480-*** (AC Line Filter)  Festo CMMT-AS-C*-11A-P3-MP-S1	

Component	Requirements	Examples
<p>NOTE: IAI drives require fan module to achieve ambient temperature rating of 55° C Option for the China region only.</p> <p>2. Servo Motors</p>	<p>IAI (Intelligent Actuator Inc.)</p> <p>RSEL Series</p> <p>RSEL-G-EP-**-FU (Master Unit)</p> <p>RCON-***-*(Driver Unit)</p>	
	<p>RCON Series</p> <p>RCON-GWG-EP-FU (Master Unit)</p> <p>RCON-***-*(Driver Unit)</p>	
	<p>RCM-101-USB (Software)</p> <p>RCON-FU (Fan unit)</p>	
	<p>Allen-Bradley</p> <p>VPL-A*****1*A* (0.46-13.38 Nm, 200V Class)</p> <p>VPL-B*****1*A* (0.46-33.0 Nm, 400V Class)</p>	
	<p>MPL-A*****7*AA (0.26-26.8 Nm, 200V Class)</p> <p>MPL-B*****7*AA (0.26-163 Nm, 400V Class)</p>	
	<p>MPM-A*****J7*AA (7.65-30.96 Nm, 200V Class)</p> <p>MPM-B*****J7*AA (2.18-62.8 Nm, 400V Class)</p>	
	<p>VPC-B*****FS (17.6-191.1 Nm, 400V Class)</p>	
	<p>Bosch Rexroth</p> <p>MS2N03-*0BYN-C****-NNNNN-NN</p> <p>MS2N04-BOBTN-CSSL0-NNNNN-NN</p>	
	<p>Festo</p> <p>EMMT-AS-***-*-HS-RM*</p>	
3. On-Machine Servo Drive and Motor Unit	<p>ArmorKinetic</p> <p>2198-DSM0**-ERS*-***** (Distributed servo drive and motor)</p>	
4. Stepper Drives	<p>Festo</p> <p>CMMT-ST-C8-1C-MP-S0</p>	
5. Stepper Motors	<p>Festo</p> <p>EMMT-ST-***-RM*</p>	
6. Electric Actuators	<p>Festo</p> <p>EGC-***-BS-**-KF-0H-ML-GK (Linear Ballscrew)</p> <p>EGC-***-TB-KF-0H-GK (Linear Belt Drive)</p>	
	<p>ELGA-BS-KF-***-0H-**-ML (Linear Ballscrew)</p> <p>ELGA-TB-KF-***-0H (Linear Belt Drive)</p>	
	<p>ESBF-BS-***-** (Cylinder Ballscrew)</p> <p>EAGF-V2-KF-***-** (Cylinder Guide Unit)</p>	
	<p>EGSL-BS-***-** (Slide Ballscrew)</p>	
	<p>ERMB-** (Rotary)</p>	
<p>NOTE: Option for the China region only.</p>	<p>NOTE: Festo axial and gear box mounting kits available for non-Festo servo motors.</p>	
	<p>IAI (Intelligent Actuator Inc.)</p> <p>RCP6-SA*C-WA-56P-**-P3-*B (Slider Actuator)</p> <p>RCP6-RA*C-WA-56P-**-P3-*B (Rod Style Actuator)</p>	
	<p>RCS4-SA*C-WA-400-**-T2-*B (Slider Actuator)</p> <p>RCS4-RA*C-WA-400-**-T2-*B (Rod Style Actuator)</p>	
	<p>RCP2-RTCBL-I-35P-*360-PS-M (Rotary)</p> <p>RCS2-RTC10L-**-360-T2-M-L (Rotary)</p>	



Component	Requirements	Examples
E. Enclosure		
1. Enclosures, Operator Panels, Junction Boxes	Minimum of IP54 or NEMA12	Hoffman Rittal SCE
2. Enclosure Cooling		
a) Fan & Filter	CE CCC (C) IP54 Type 12 filter 10-micron pleated element NOTE: Thermostats are encouraged	Hoffman Pfannenber Rittal
b) Air Conditioners	CE CCC (C) IP54 Condensate Evaporator	Hoffman Pfannenber Rittal IceQube
3. Power Distribution Blocks	IEC 60947-7-1 or UL1953 Screw Termination Copper and Aluminum Rated IP2X Minimum CE CCC (C)	Allen Bradley 1492-PD Series  Eaton CHDB Series  Phoenix PTU 35/4x6/6x2,5 (China preference) PTFIX 6/18x2,5-NS35 (China preference)  Wohner 30Compact (China preference)
4. Terminals	IEC 60947-7-1 or UL1059 (Non-Protective Earthing) IEC 60947-7-2 (Protective Earthing) DIN Rail Mounted Spring or Screw Clamp Maximum of 2 Tiers IP2X Minimum CE CCC (C)	Allen Bradley 1492 Series  Phoenix UT or PT Series  Weidmuller

Component	Requirements	Examples
<b>F. Ethernet Switch</b> 1. Managed  NOTE: Managed switches are required for factory network connections.          NOTE: All Cisco IE Series switches shall be registered to Nexteer Automotive.	Allen-Bradley Stratix 5200 1783-CMS6B (Base Firmware, 4 RJ45 Ports) 1783-CMS6P (Full Firmware, CIP Sync Support, 4 RJ45 Ports) 1783-CMS10DB (Base Firmware, 10 RJ45 Ports) 1783-CMS10DP (Full Firmware, CIP Sync Support, 10 RJ45 Ports) 1783-CMS20DB (Base Firmware, 20 RJ45 Ports) 1783-CMS20DP (Full Firmware, CIP Sync Support, 20 RJ45 Ports)  Allen-Bradley Stratix 5800 1783-MMS10B (Layer 2 Firmware, 8 RJ45 Ports, Fixed) 1783-MMS10 (Layer 2 Firmware, 8 RJ45 Ports, Modular) 1783-MMX8T (8 RJ45 Ports, Expansion) 1783-MMX16T (16 RJ45 Ports, Expansion)  Cisco 2000 Series IE-2000-4T-G-L (Lite Firmware, 6 RJ45 Ports) IE-2000-8TC-G-L (Lite Firmware, 10 RJ45 Ports) IE-2000-8TC-G-E (Base Firmware, CIP Sync Support, 10 RJ45 Ports) IE-2000-16TC-G-L (Lite Firmware, 18 RJ45 Ports) IE-2000-16TC-G-E (Base Firmware, CIP Sync Support, 18 RJ45 Ports)  Cisco 3000 Series IE-3200-8T2S-E (Layer 2 Firmware, 8 RJ45 Ports, Fixed) IE-3300-8T2S-E (Layer 2 Firmware, 8 RJ45 Ports, Modular) IEM-3300-8T (8 RJ45 Ports, Expansion) IEM-3300-16T (16 RJ45 Ports, Expansion)  Kyland SICOM3000A-8GE-L5-L5-PN (C) SICOM3000A-16GE-L5-L5-PN (C)	
2. Lightly Managed	Allen-Bradley Stratix 2500 1783-LMS5 (5 RJ45 Ports) 1783-LMS8 (8 RJ45 Ports)  Cisco 1000 Series IE-1000-4T1T-LM (5 RJ45 Ports) IE-1000-6T2T-LM (8 RJ45 Ports)  Kyland SICOM3000A-8T-L5-L5-PN (C) SICOM3000A-16T-L5-L5-PN (C)	
3. Power Over Ethernet (PoE) Injector  NOTE: Allowed only on devices requiring PoE.	IP2X Minimum CE 24Vdc IEEE 802.3af or IEEE 802.3at PoE Ports function at minimum 10/100Mbps DIN Rail Mounted	Hirschmann 942-059-001  MOXA INJ-24A  Phoenix Contact 2703005
4. Ethernet Network Media (Cables) a) PLC, HMI, Ethernet Switches, In-Cabinet Environments	Stranded Copper STP-Shielded Twisted Pair or FTP-Foil Twisted pair Cat 5e or Cat 6 Patch Cables IP2X Minimum	Allen Bradley Belden Panduit
b) Open Cable Tray, On-Machine Environments	Stranded Copper STP-Shielded Twisted Pair or FTP-Foil Twisted pair Cat 5e or Cat 6 Patch Cables IP67 Type CMP, CMR, CMG, or CM (Tray Rated) High Flex (Applications with cable flexing or movement)	
5. Ethernet Bulkhead Connectors	Minimum of IP54 (external to enclosure)	
<b>G. Fuses</b> 1. Disconnect	UL Class J	

Component	Requirements	Examples
H. Human Machine Interface Devices 1. Graphic Terminal	Allen-Bradley PanelView Plus 7 (Standard) 2711P-T7C2*D8S (6.5") 2711P-T10C2*D8S (10.4")  PanelView Plus 7 (Performance) 2711P-T7C2*D9P (6.5") 2711P-T10C2*D9P (10.4")  Pro-Face PFXST6500WADE (10") PFXST6600WADE (12")	
I. Code Reader (1D & 2D Codes) 1. Basic Operation  NOTE: Feasibility study recommended.	Cognex – Dataman DMR-280X-1120 (Close Working Distance) DMR-280X-MAX (Long Working Distance) DMR-37*-TMAX (Fixed) DMR-8700DQ Series (Handheld)  Keyence SR-1000 (Fixed) SR-1000W (Fixed) SR-X100 (Fixed) SR-X100W (Fixed) HR-X100 (Handheld)	
2. Challenging Applications  NOTE: Feasibility study REQUIRED.	Cognex – Dataman DMR-37*-TMAX (Fixed) DMR-8700DX-E (Handheld)  Keyence SR-2000 (Fixed) SR-2000W (Fixed) SR-X300 (Fixed) SR-X300W (Fixed) HR-X300 (Handheld) HR-X500 (Handheld for DPM) HR-NU2 (Handheld Network Unit-PoE Injector)	
3. Code Verifiers	Cognex 8072V – (Handheld)  Webcam Tru Check Omni Series (Paper label) DPM Tower or FlexHite Series (DPM or Laser etched)	

Component	Requirements	Examples
J. Laser Markers	NOTE: Refer to the Manufacturing Equipment Purchase Specification and / or the Purchasing Manufacturing Engineer.	
1. Plastic Surface Applications	<p>Keyence MD-X2000 (3 Axis Hybrid Laser Marker 13W) Options: MD-AD-ZT (Auto-focus/lens inspection software upgrade) MD-AD-3D (3D software to mark on angles/curves/multiple Z-heights) MD-C1 (contactor/Laser Safety Module to achieve PL rating) MD-U1000C (3 Axis UV Laser Marker)</p> <p>Telesis EVCDSE (1064nm), EV4GDSE (532nm), UV Kryo (355nm) Options: Vari-Z/3D marking iZONIT GigE vision for code read and/or mark location Auto-focus (Vari-Z option required) Vortex Cooling</p>	Laser Integration (enclosure) must comply with ANSI and OSHA safety standards.
2. Metal Surface Application	<p>Keyence MD-X2500 (3 Axis Hybrid Laser Marker 25W) Options: MD-AD-ZT (Auto-focus/lens inspection software upgrade) MD-AD-3D (3D software to mark on angles/curves/multiple Z-heights) MD-C1 (contactor/Laser Safety Module to achieve PL rating) MD-F5200C (3 Axis Hybrid Laser Marker 50W) MD-F5220C (3 Axis Hybrid Laser Marker 50W, wide range)</p> <p>Telesis F Series Fiber Laser 30, 50, and 100W options (200W upon request) Options: Vari-Z/3D marking iZONIT GigE vision for code read and/or mark location Embedded camera for code read (GigE and Cognex options available) Auto-focus (Vari-Z option required)</p>	
3. Laser System Enclosure	Class 1 Enclosure	
NOTE: Laser Safety Officer shall be contacted to review each laser enclosure.	Comply with ANSI and OSHA safety standards.  Accession Number required	
K. Lights		
1. Status Lights		
a) Multi-Color LED Pilot Light	24VDC IP65 CE	<p>Banner K50LGRYPQ (Tri Color) K30LGRYPQ (Tri Color) K80L4GRYB1PQ (Quad Color) M18GRYPQ WLS27*WGRYB5-****DS24Q WLS28-2*WGRYB5-****DS24Q</p>
b) Stack Lights	24VDC IP65 CE	<p>Allen-Bradley 855E Series Tower Lights 854J (40mm) &amp; 854K (60mm)</p> <p>Banner TL50</p> <p>Balluff BNI008*</p>
2. Machine & Work Lighting	24VDC IP65 CE	<p>Banner WLC60*W***AQ WLC90W***</p> <p>Banner WLS28-2*W***DSQ WLS27-*W***DSQ WLS15*DW*****DSQP</p>
3. Enclosure Lighting	24VDC IP2X CE	<p>Banner WLS28-2*W***D*Q WLS27-*W***D*Q WLS15*DW*****D*QP</p>

Component	Requirements	Examples
<b>L. Motors (3-Phase)</b> 1. Motor Starter / Contactor Controlled a) General Applications	TEFC or IP54 NEMA MG 1 or IEC 60034 T-Frame Premium Efficiency or IE3 NEMA Design B or IEC Design N  Rated for the intended region UL (NA) CE (E) CCC (C) INMETRO (B) BIS (I)	WEG Electric – 01518T3E254T  Marathon Electric - 254TTFNA6026  TECO-Westinghouse – HB0154
	b) Hydraulic Power Unit	Baldor Electric Company - CEM2333T  US Motors (Nidec) – U15P2DC
	c) High Slip Applications (Example: Presses, Heavy Conveyors)	
	2. Variable Frequency Drive Controlled (VFD)	Baldor Electric Company - EM2333T
<b>M. Plug/Socket Combination</b> 1. When interlocking is not required per SD-004.	First Make / Last Break PE (earthing) contact Retaining Means IP54 CE CCC (C)	Harting  Hubbell Twist-Lock
	2. When interlocking is required per SD-004. (such as 30A or greater)	Meltric Corporation  Hubbell Circuit-Lock
<b>N. Programmable Logic Controllers &amp; Modules</b> 1. Controllers	Allen-Bradley 5069 Compact GuardLogix 5380 5069-L3**ERS2 5069-L3**ERMS2 (CIP Motion)  5069 CompactLogix 5380 5069-L3**ER 5069-L3**ERM (CIP Motion)  1756 GuardLogix 5580 1756-L8*ES  1756 ControlLogix 5580 1756-L8*E	
	2. Power Supplies	Allen-Bradley 1756 ControlLogix 1756-PB72 (10A) Chassis Series A or B 1756-PB75 (13A) Chassis Series B
	3. Communication Modules	Allen-Bradley 1756 ControlLogix 1756-EN4TR (Dual Port Ethernet/IP, 1-256 Motion Axis)
	4. I/O Modules a) Chassis Based	Allen Bradley 5069 Compact GuardLogix I/O 5069 CompactLogix I/O  1756 GuardLogix I/O 1756 ControlLogix I/O  NOTE: OW16 relay output modules shall only be used on applications with a very limited number of cycles due to low mechanical cycles rating per output. NOTE: 32pt 1756 I/O Modules SHALL use removable terminal blocks (RTB) and prewired cables.

Component	Requirements	Examples
b) In-Cabinet Distributed (IP20)	Allen-Bradley 1734 Point Guard I/O 1734 Point I/O	
	5069 Compact GuardLogix I/O 5069 CompactLogix I/O	
c) On-Machine Distributed (IP65/67) 1) Ethernet/IP	Allen Bradley 1732ES-IB16 (Safety, 16pt Discrete Input, Dual EtherNet/IP Ports) 1732E-16CFG12R (16pt Configurable, Dual EtherNet/IP Ports, 4-Pin Mini Power)	
	Balluff BNI004F - BNI EIP-302-105-Z015 (16pt, Dual EtherNet/IP Ports)	
	Turck TBEN-L4-16DXP (16pt Input, Dual EtherNet/IP Ports)	
2) IO-Link Master (Network Interface)	Allen Bradley 5032-8IOLM12DR (8 port, 8 IO-Link, 4-Pin Mini Power)	
	Balluff BNI006A - BNI EIP-508-105-Z015 (8 port, 8 IO-Link, 4-Pin Mini Power) BNI00HW - BNI EIP-508-005-R015-013 (8 port, 8 IO-Link, 4-Pin Mini Power)	
3) IO-Link Hub (Block)	Allen Bradley 1732IL-IB16M12 (16pt, Discrete Input)	
	Balluff BNI00J0 - BNI IOL-104-011-K006 (16pt, Discrete Input, Plastic Body) BNI00AJ - BNI IOL-719-002-Z012 (8pt Analog input, Metal Body)	
	NOTE: For thermocouple application, only ungrounded thermocouples shall be used with an analog input block.	
5. Communication Gateways	Real Time Automation 435NBX-N700-D (ASCII to EtherNet/IP) 490NBX-NNA1-D (EtherNet TCP/IP to EtherNet/ IP)	
	HMS Anybus HMS-EN2SE-R (EtherNet/IP to Serial)	
O. Programming Port with Receptacle (External access for Ethernet Devices)	IP54 Minimum CE  NOTE: Single phase AC receptacle shall have Residual Current Protection (RCP). Refer to SD-004, section 15 for clarification.	Grace Engineered Products P-R2-K3RF0-U626 (NA configuration) P-R2-M3REF0-U626 (Europe configuration) P-R2-M3RAF0-U626 (China configuration) P-R2-K3RW0-U626 (Brazil configuration) P-R2-M3RUV0-U626 (Universal)  Mencom GF-RJ45-R-32 (NA configuration) EP-RJ45-R-32 (Europe configuration) DCH2-RJ45-R-32 (China configuration) DBR-RJ45-R-32 (Brazil configuration) DUN-RJ45-R-48 (Universal)  Weidmueller 1450530000 (China configuration) 1450550000 (China configuration) 1962840000 (China configuration) 1487920000 (China configuration) 1450790000 (China configuration)

Component	Requirements	Examples
P. Pushbuttons, Pilot Lights, and Selector Switches 1. General Pushbuttons, Pilot Lights, and Selector Switches	IEC 22.5mm IP62 CE	Allen-Bradley 800F (Europe/Morocco preference) 800F -AL01 (Locking cover for Robot Teach Mode Selection)  Schneider Electric XB4
2. E-Stop Pushbutton	IEC 60947-5-5 ISO 13850 CE Self-Latching Type Red Mushroom Head	Allen-Bradley 800F  Schneider Electric XB4
3. Cable-Operated E-Stop Switch	IEC 60947-5-5 ISO 13850 CE Self-Latching Type	Allen-Bradley 440E  Euchner RPS Series  Telemecanique XY2 Series
4. Zero-Force Buttons		
a) Cycle Initiation	Banner EZ Light Touch (Illuminated) K50APTGRCO	NOTE: This model has Green and Red lights.
b) Two-Hand Control (Safety Applications)	Banner STB Series STBV***	
Q. Operator ID Systems	NOTE: Refer to the Manufacturing Equipment Purchase Specification and/or contact the purchasing engineer.	
1. Badge Reader a) Magnetic Strip	RFIDeas - pcSwipe Enroll MS-300M1AK5 BKT-BASE (Base Kit)	NOTE: Only available in RS-232 ASCII communications.
b) Proximity/RFID NOTE: Verify card type based on plant region.	RFIDeas - pcProx Plus KT-800W1AKB-P-IP67	NOTE: Nexteer badges are HID Smart Card (8K) using 13.56MHz frequency, ISO/IEC 14443 Type A.
R. Relay, Control  NOTE: Master, control power distribution, and safety circuit relay applications.	IEC Industrial control relay IEC 60947-5-1 IP2X Minimum Minimum Contact Rating of 10A @ AC-12, 5A @ DC-13 Minimum Contact Switching Capacity of 5mA or Less Mechanically Linked Contacts (Force-Guided) DIN rail mounting CE CCC (C)	Allen Bradley 700-EF***QJ 700S-EF***QJC  Telemecanique CAD** BD
S. Relay, Interface  NOTE: For low current and low voltage interface / interlock applications. Do not use to control loads such as brakes or similar.	DIN Rail Mounting IP2X Minimum CE CCC (C)	Allen-Bradley 700-HL Series 700-HLT1Z24 (hard contact, 24vdc coil) 700-HLS1Z24 (solid state 24vdc load & coil)  Telemecanique Miniature Relay RXM4AB2BD (50/60HZ, Coil 24vdc) RXG23BD  Phoenix Contact (C) PLC-R (2966171) PLC-O (2966634)
T. RFID Systems - Pallet/Part Tracking 1. Antenna	Balluff BIS00LH - BIS M-400-045-001-07-S4 (30mm Cylinder, 0-36mm range) BIS00LK - BIS M-401-045-001-07-S4 (Square Head, 0-60mm range) BIS00LJ - BIS M-400-045-002-07-S4 (30mm Cylinder, 0-20mm range)  NOTE: Distances greater than 2 meters from the BNI Module to Antenna require a SHIELDED M12 Male / Female patch cable.	
2. Data Carriers	Balluff BIS0045 - BIS M-111-02/L (2000 Byte, 30mm x 2.8mm, unlimited READS, 10 million WRITES)  NOTE: Data Carriers that meet iCODE ISO15693 may be considered but require Control Engineer's prior approval.	

Component	Requirements	Examples
U. Safety Interlock Switches 1. Non-Contact Type	Allen Bradley 440N-Z21S**H* (switch) 440N-Z**PTB (actuator, plastic barrel) 440N-Z18SSTB (actuator, stainless steel barrel) 440N-ZPRECB (actuator, rectangular)  Euchner CES-I-AR-M-C04-USA-119479 (switch) CES-A-BBN-C04-115271 (actuator) BTC-CES04-S-TH-21-F-123583 (slide Bolt)  Keyence GS-11PC (switch) GS-A01 (actuator)  Pilz PSEN cs1.1p / PSEN cs1.1 (540000) (switch & actuator)	
2. Guard Locking Type  NOTE: Guard locking function shall be based on MRA and requirements of SD-012.  a) Power-ON to Release (power to unlock)  NOTE: Escape Release shall be provided for a Power-ON to Release guard locking switch where full body access is possible.	Euchner STP3A-2131A024L024M-091748 (switch) STP3A-2131A024MC1993-102267 (switch, escape release option) BETAETIGER-S-***-N-0957** (actuator) FE-GRIFF-105329 (escape release)  Keyence GS-51PC (switch) GS-A21 (actuator) GS-H02 (escape release)  Telemecanique XCSLF373731* (switch) XCSLF373741* (switch) (escape release) XCSZ0* (actuator)	
b) Power-OFF to Release (power to lock)	Euchner STP4A-2131A024L024M -091749 (switch) BETAETIGER-S-***-N-0957** (actuator)  Keyence GS-71PC (switch) GS-A21 (actuator) GS-M9 Series (magnetic hold switch) GS-MA9 Series (actuator)  Telemecanique XCSLF373751* (switch) XCSZ0* (actuator)	
c) Lockable Slide Bolt	Aut-O-Loc A19461 A19462  Euchner RIEGEL S-* -09638* RIEGEL S-*F-09639* (escape release)  Keyence GS-H01  Telemecanique XCSZ05	
3. Multi-Function Gate Box	Allen-Bradley 442G-MAB*-URM-C03  Euchner MGBS-P-L1-AR-U-R-AEE-SH-159086 MGBS-H-BA1A3-R-157543 (Right Handed Handle) MGBS-H-BA1A3-L-157544 (Left Handed Handle) MGB-L1HE-ARA-R-119924 MGB-L1HE-ARA-L-119926	



Component	Requirements	Examples
V. Safety Presence Sensing Device	NOTE: PSD selection and mounting location shall be based on SD-011 and SD-012 specification requirements and safe distance calculations.	
1. Safety Light Curtain	14mm (finger) or 30mm (hand) resolution 24VDC IP65 CE IEC 61496-1 compliance to Type 4 ESPE ISO 13849 PL e	Banner S4B Series EZ Screen LP EZ Screen LS  SICK De Tec  Keyence GL-R Series
2. Safety Laser Scanners (Area Scanner)	30mm resolution capability 24VDC IP65 CE IEC 61496-1 compliance to Type 3 ESPE ISO 13849 PL d Class 1 laser classification	SICK MicroScan3 NanoScan  Keyence SZ-V Series
W. Safety Enable Device		
1. 3-Position Enable Device (Hand-Held)	24VDC IP54 CE IEC 60947-5-8	ABB JSHD4 Series  Euchner ZSM Series ZSA / ZSB Series
X. Safety Relay		
1. E-Stop, Safety Gate, Light Curtain	Allen Bradley 440R-D22R2 440R-S1*R2  Pilz PNOZ s4 #750104 PNOZ s5 #750105 (with time delayed contacts)  Euchner ESM-BA201 ESM-BA301 ESM-BT411 (with time delay contacts)	
2. Contact Expansion	Allen-Bradley 440R-EM4R2 440R-EM4R2D (with time delayed contacts)  Pilz PNOZ s7 #750107 PNOZ s9 #750109 (with time delayed contacts) PNOZ s11 #750111  Euchner ESM-ES301 ESM-TE301 (with time delay contacts)	
3. Two-Hand Control	Allen-Bradley 440R-D23171  Pilz PNOZ s6 #750106	
4. Zero Speed Indicator	Pilz PSWZ X1P #777949	
5. Safety Timer Relay	ABB Sentry TSR10  NOTE: Used on full body access cells with blind spots, requiring a Pre-Reset feature.	

Component	Requirements	Examples
<b>Y. Motor Starters/Contactors</b> 1. Contactors/Overloads           2. Motor Starter/Protector (MSP)	IEC 60947-4-1 IP2X Minimum DIN rail mounting CCC (C) CE  NOTE: For safety circuit expansion contactor application, mechanically linked contacts (force-guided, direct-drive) and low-energy (5mA or less) auxiliary contact switching capability are required.  IEC 60947-4-1 IP2X Minimum DIN rail mounting CE CCC (C)	Allen Bradley 100-E / 100S-E 104-E (Reversing) 193 (Overload Relay)  Schneider LC1D LC2D (Reversing) LC1F (>75HP, Non-Reversing) LA9F970 (Mechanical Interlock) LRD**** (Overload Relay)  Allen-Bradley 140MT Series  Schneider GV2P Series
<b>Z. Support Software Requirements</b> 1. Programmable Logic Controllers (PLC)           2. Human Machine Interface (HMI)	Rockwell Software - Studio 5000 Design Environment 9324M-RLDT2* (Standard Edition) 9324M-RLDT3* (Professional Edition) Standard Edition Add-Ons 9324M-RLDRT3* (Structured Text Option) (** options) 0 = Self Support 1 = 8-5, M-F Support 2 = 24/7 Support Version 35 or newer  Rockwell Software FactoryTalk View Studio ME 9701-VWSTNMRT1* Version 15 or newer  ProFace GP-Pro EX Version 4.0 or newer	
<b>AA. Disconnect Switches</b> 1. Flange Mounted Disconnect           2. Rotary Disconnect           3. Single Phase Supply           4. Supplementary Disconnect (Load Switch)   NOTE: Local motor isolation, disconnect switch and robot disable applications.           5. Disconnect Fuses	Lockable in OFF position only IEC 60947-1 - General rules IEC 60947-3 – Switches, disconnects, switch CE CCC (C) IP2X Minimum or suitably protected to IP2X  Lockable in OFF position only IEC 60947-1 - General rules IEC 60947-3 – Switches, disconnects, switch CE CCC (C) IP2X Minimum  lockable in OFF position only IEC 60947-1 - General rules IEC 60947-3 – Switches, disconnects, switch CE CCC (C) IP2X Minimum  Lockable in OFF position only. IEC 60947-1 - General rules IEC 60947-3 – Switches, disconnects, switch CE CCC (C) IP2X Minimum  UL Class J	Allen-Bradley 1494U Series (China preference) 1494V Series  Square D 9422 Series  Allen-Bradley 194R-J30-1753 (30A, Class J) 194R-J60-1753 (60A, Class J) 194R-SDK2 NOTE: Side-Mounted Switch Kit, for all 194R-30/60A disconnect switches.  Bussman CCP-1-30CC NOTE: Maximum Fuse Size = 30 Amp LP-CC-30. CCP must be used with VCF2 or similar rotary disconnect.  Square D VCF2  Allen-Bradley 194E-E** 194E-FA**E (with enclosure) 194E-E16-1753-4G (robot disable)  Schneider V01 (switch disconnect) V01C (switch disconnect) VBFXGE1 (black handle, enclosure)  Bussman Ferraz Shawmut

Component	Requirements	Examples
BB. Switches and Sensors		
1. Level		
a) Oil, water, coolant applications	IFM Efector LK8122 LK8123 LK8124 NOTE: Each has 4 configurable digital outputs (4 level)  LT8022 LT8023 LT8024 NOTE: Each has 4 configurable digital outputs (2 level / 2 temperature)  LK3122 LK3123 LK3124 NOTE: Each has 1 configurable digital and 1 analog output (2 level)	
b) Plastics, non-ferrous materials	IFM Efector KI5085	
2. Flow	IFM Efector SI5010 (Fast response) with: E40096 M18x1.5, G1/4 adapter, or E40106 M18x1.5, 1/4NPT adapter and U40030 ½" NPT tee. Pressure applications of up to 3000PSI  SA5000 With temperature. Coolant, cutting fluid and water applications less than 1450 PSI  Pressures less than 230 PSI SM6004 (0-6.6 GPM, 1/2G, Analog, 4-20mA) SM7004 (0-13.2 GPM, 3/4G, Analog, 4-20mA) SM8004 (0-26.4 GPM, 1G, Analog, 4-20mA) SM9004 (1.3-80 GPM, 2G, Analog, 4-20mA) SM2004 (1.3-160 GPM, 2G, Analog, 4-20mA)  GEMS (Air) FS-10798 Series 25365  DI water applications Universal Flow Monitors (UFM) CP4-M1T1C1, 1.2-12GPM	
3. Air Gaps	SMC ISA3-HFP-1N ZS-31-B (cable) ISA-14 (Mounting bracket – Required if not mounted to DIN rail)  Required if mounting multiple units together: ISA-15 Seal for additional station ISA-16-* Bolt Kit (* indicates number of stations)	
4. Integral Cylinder Proximity		
a) T-Slot	Festo SMT-8M-A-PS-24V-E-0.3-M8D, 574334 SMT-8G-PS-24V-E-0.3Q-M8D, 547860 (90-degree head) NOTE: Both are 0.3 meter, M8 plug termination with external rotatable thread.  IFM Efector MK5101 NOTE: 0.3 meter, M8 plug termination with external fixed thread.  Turck BIM-UNT-AP6X-0.3-PSG3S, 4685722 NOTE: 0.3 meter, M8 plug termination with external fixed thread.	

Component	Requirements	Examples
b) C-Slot  Festo - HGPT, HGPD, HGPL SMC - CD55, CDQM, MHZ2	Festo SMT-10M-PS-24V-E-0,3-L-M8D, 551375 SMT-10G-PS-24V-E-0,3Q-M8D, 547863 (90-degree head) NOTE: Both are 0.3 meter, M8 plug termination with external rotatable thread.  IFM Efector MK5310 NOTE: 0.3 meter, M8 plug termination with external fixed thread.  Turck BIM-UNR-AP6X-0.3M-PSG3S W/M NOTE: 0.3 meter, M8 plug termination with external fixed thread.  SMC D-M9PSAPC NOTE: 0.5 meter, M8 plug termination with external fixed thread.	
c) Brackets  Festo - DSNU-12-* SMC - CD85   Festo - DSNU-25 SMC - CD85   SMC - CD55, CDQM   SMC - C96NB	Festo SMBR-8-12, 175093  IFM Efector E11816  Turck KLR-1 W/ASB-2  Festo SMBR-8-25, 175096  IFM Efector E11818  Turck KLR-1 W/ASB-3  SMC D-M9PSAPC  IFM E11797	
5. Limit a) General Applications	Heavy Duty Industrial Limit Switch Metal Case IEC 60947-5-1 CE  NOTE: In high moisture situations, potted versions (IP66) should be applied.	Allen-Bradley 802 Series  Telemecanique ZCK J1(xx) (body) ZCK E(xx) (head)
6. Pressure and Vacuum  Output 1 = Digital signal Output 2 = Digital or Analog signal   Output 1 = Digital signal Output 2 = Digital signal	IFM Efector PN2094 (Pneumatic, -14.5-145 PSI) (G1/4) PN2099 (Pneumatic vacuum, -14.5-14.5 PSI) (G1/4) PN2071 (Hydraulic, 0-3625 PSI) (G1/4)  E30420 (Protective cover) EVC00* (90-degree cable) E10077 (Mounting Clamp)  Differential (Coolant and Water) IFM Efector PNI024 with PA3024 (G1/4) E11566 (splitter)	

Component	Requirements	Examples
7. Proximity (Metallic)		
a) Dry Applications (long distance)	IFM Efector IM5115, 40mm size, M12, 20mm range IM5117, 40mm size, M12, 40mm range	
b) Wet / Dry Applications	IFM Efector IEC200, 8mm size, M12, flush, 2mm range IE5379, 8mm size, M12, flush, 2mm range IFT257, 12mm size, M12, flush, 4mm range IFT245, 12mm size, M12, non-flush, 6mm range IGT258, 18mm size, M12, flush, 8mm range IGT249, 18mm size, M12, non-flush, 12mm range IIT243, 30mm size, M12, flush, 15mm range IIT231, 30mm size, M12, non-flush, 25mm range	
c) Welding and Hardening Applications (weld slag resistant & magnetic-field immune)	IFM Efector IER200, 8mm size, M12, flush, 2mm range IEW200, 8mm size, M8, flush, 3mm range IFR207, 12mm size, M12, flush, 4mm range IGR207, 18mm size, M12, flush, 8mm range IIR207, 30mm size, M12, flush, 15mm range	
8. Photoelectric (Presence, color, shape, distance, etc.)	LED indication IP65 dry applications IP67 wet applications Short Circuit Protection 10-30vdc 3 wire PNP sourcing Reverse Polarity Protection CE	Banner  IFM Efector - O Series, Through Beam Retro-reflective, Diffuse, and Laser. IFM Efector - OB Series, Fiber Optics  Keyence  Sick
9. Temperature (Coolant and water applications)	IFM Efector TR2439  NOTE: For hydraulic tank level and temperature applications, use ACT Temp/Level switch, 130 FB40033AFD2M558.	
CC. Transformers		
1. General Purpose	UL1561 IP2X (Internal/External enclosure mount) CE  NOTE: Transformers mounted external to the electrical enclosure must be encapsulated or rated for external use (such as Nema Type 3R)	Square D 9070T **** D1 (requires additional finger safeguard for IP2X) xx S40F  Sola Hevi-Duty HS Series (external mount)  Eaton STZ, DTZ (requires additional finger safeguard for IP2X)  PowerTran Series A480MT SeriesPTN102
2. Transformer Disconnect (lighting)  NOTE: For excepted circuit applications (example: circuits powered ahead of the Main Disconnect).	CE (E) CCC (C) Isolation transformer with secondary isolation IEC-60742 Within its own enclosure Internal mounted IP2X External mounted IP54  NOTE: Transformer Disconnect shall meet disconnect requirements defined in section 7.Z NOTE: Ground fault protection is required for any receptacle, either by receptacle or upstream circuit protection.	Dongan Series TDL (IP20 applications) Series TDL12 (IP54 applications)  PowerTran Series PLD (IP20 applications) Series PLDN (IP54 applications)

Component	Requirements	Examples
DD. Vision Applications	NOTE: Feasibility study REQUIRED for all applications, except vision guided robots.	
1. Vision Sensor (Basic Applications)	Cognex In-Sight 2000 Series In-Sight 2800 Series In-Sight SnAPP Series	
	Keyence IV Series IX Series	
2. Vision Systems (Complex Application)	Cognex In-Sight 7000, 8000, 9000 Series In-Sight 3800 Series In-Sight D900	
	Keyence IV Series CV-X Series VS Series XG-8000 Series	
3. Vision Systems 3D	Cognex In-Sight L38 Series A5000 Series	
	Keyence XGX Series LJ-X8000 Series LJ-S8000 Series	
4. Visualization Display / Software	Cognex – Vision View VNPC-SL (Software for use on PC)	
NOTE: Standard PC, monitor, and software. Installed at readily accessible location.	Keyence IV3-CP50 (Intelligent Monitor) IV3-Navigator (Software) IV4-Navigator (Software)	

## 8. Manufacturing Information Technology System Components

The "Component" column is organized by component type. Nexteer Automotive does not have requirements for technologies not listed.

The "Requirements" column has two functions:

- 1) Where component brand or part numbers are designated, this is the Nexteer Automotive approved (required) component.
  - Where multiple brands or part numbers are listed, OEM's are allowed to select the one that provides the best value. Components are not listed in any preferred order.
- 2) Where specifications are provided, components are required to meet these specifications.

NOTE: To identify regional requirements, the following notations are used: (B) - Brazil; (C) - China; (I) - India; (E) - Europe & Morocco; and (NA) - North America. If not specifically noted with region letter designation, any of the designated components may be used.

The "Examples" column lists components that meet the requirements listed in the "Requirements" column. The example components are not required.

NOTE: Changes since the last revision are highlighted

Component	Requirements	Examples
<b>A. Computer Hardware</b> 1. Standard PC (Traceability / Monitoring / LabView Test Equipment)	Machine Requirements: Windows 11 Pro version 22H2 Vendor software & PC must be compatible with ESET antivirus software. NOTE: Wifi devices NOT allowed  Hardware below is recommended as a minimum: Intel i5 14th Gen Processor 16GB RAM Memory 512 GB M.2 NVME SSD 1 Ethernet Port	Dell Precision Advantech
	Requires USB connection to PC with configuration to command PC to shut down if power outage exceeds one minute.	TrippLite INTERNET350U (120VAC) TrippLite AVR550U (220VAC)