



Approved Components List

Global Common

SD-007

ISSUED March 8, 2007

REVISED December 01, 2023

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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.

Where an approved supplier is followed by "(Special Applications)," these components may be used but require the Controls Engineer's prior approval.

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.
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2. Manufacturing Engineering - Major Mechanical Components

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

The "Global Common / Requirement" column has two functions:

- 1) Where components are designated, this is the Nexteer Automotive approved (required) component.
 - Where multiple brands 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 is 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 supplier's components may be used.

The "Examples" column lists example components that may be used providing they meet the specifications of the "Global Common / Requirement" column. These example components are readily available in our global regions. Example components are not listed in any preferred order.

NOTE: To identify regional preferences, the following notations is 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 supplier's components may be used.

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NOTE: Changes since the last revision are highlighted

Mechanical Component	Global Common / Requirement	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 (Special Applications)	
C. Driverless Vehicles (AMR, AGV, AGIV)	Omron MIR NOTE: Additional Autonomous Mobile Robots and Automated Guided 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/ISDF B56.5.	
D. Gear Reducers	Requirements based on Application	Bonfiglioli Ohio Bosch-Rexroth Seimens Boston SEW Eurodrive Lenze Sumitomo Drive Tech Morse Nord Drivesystems Winsmith
E. Indexers	Camco-Ferguson Swanson Erie Weiss NOTE: Shall use AB PowerFlex 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	

Mechanical Component	Global Common / Requirement	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	Selection of hardware below is application specific. Refer to SD-1040 for clarification	
1. Actuator	<u>Fanuc Mate Series</u> Arc Mate Series LR Mate Series <u>Fanuc M Series & R Series</u> M-10i Series M-20i Series M-710i Series R-1000i Series R-2000i Series <u>Fanuc SCARA Series</u> SR-3i Series SR-6i Series SR-12i Series SR-20i Series	
2. Controller NOTE: For European Controllers it is preferred to purchase with Auto/T1 operator panel rather than installing the Retro Kit.	<u>Fanuc Mate Series</u> R-30iB Plus Mate <u>Fanuc M Series & R Series</u> R-30iB Plus A-Cabinet <u>Fanuc SCARA Series</u> R-30iB Compact Plus	
3. Safety I/O NOTE: Adds SFDI / SFDO signals to the robot controller.	<u>Fanuc R-30iB Plus Mate</u> Mate-Safety-IO (NA) A05B-2650-J132 (B) (C) (I) (E) A05B-2650-J180 (B) (C) (I) (E) A05B-2600-J131 (B) (C) (I) (E) <u>Fanuc R-30iB Plus A-Cabinet</u> MHIB-SAFETY-IO (NA) A05B-2602-J201 (B) (C) (I) (E) A05B-2605-J445 (B) (C) (I) (E) A05B-2600-J131 (B) (C) (I) (E)	
4. Transit Board, End Effector I/O NOTE: Required based on Machine Risk Assessment.	Fanuc R-30iB Plus A-Cabinet A05B-2626-J465	
5. Auto / T1 Switch Retro Kit NOTE: Retro Kit required for robot controllers provided with T2 mode.	A05B-2601-K201	
J. Industrial Robot Software	Software options below are all required unless specified. Refer to SD-1040 for clarification.	
1. EIP Options (a or b required) a) Advanced Ethernet / IP Package	R860 Advanced EIP Package (NA) R784 Ethernet / IP Adapter (B) (C) (I) (E) R822 Ethernet / IP EDA (B) (C) (I) (E) R850 PC Remote iPendant (B) (C) (I) (E) R553 HMI Devices (SNPX) (B) (C) (I) (E) R843 Remote / iPendant (B) (C) (I) (E)	
b) Ethernet / IP Adapter Software	R784 Ethernet / IP Adapter Software	
c) Ethernet / IP Safety (required with safety PLC)	R713 Ethernet / IP Safety	

Mechanical Component	Global Common / Requirement	Examples
2. Motion Package	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)	
3. DCS Option (a or b required) a) Advanced DCS Package	R859 Advanced DCS Package (NA) J567 DCS Pos/Speed Check (B) (C) (I) (E) J568 DCS Safe I/O Connect (B) (C) (I) (E) R764 4D Graphics (B) (C) (I) (E)	
b) DCS Position and Speed Check	J567 DCS Position & Speed Check NOTE: Allowed when application does not require Safe IO connect	
4. Karel	R632 Karel	
K. Screwdrivers	Refer To Manufacturing Equipment Purchase Specification or Purchasing Manufacturing Engineer Atlas Copco Stanley Webber	
L. Shaft Overload 1. Not Timed	Dodge Morse	
2. Timed	Ferguson Standard Tool	
M. 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

The "Process and Test Engineering" column is organized by components. Nexteer Automotive does not have requirements for technologies not listed.

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The "Examples" column lists example components that may be used providing they meet the specifications of the "Global Common / Requirement" column. These example components are readily available in our global regions. Example components are not listed in any preferred order.

NOTE: To identify regional preferences, the following notations is 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 supplier's components may be used.

NOTE: Where an approved supplier is followed by "(Special Applications)," these components may be used but require the Controls Engineer's prior approval.

NOTE: Changes since the last revision are highlighted

Process and Test Engineering	Global Common / Requirement	Examples
A. Data Acquisition Cards NOTE: Submit proposed choice to Manufacturing Test Engineer for Approval. 1. I/O Connector Block 2. FPGA (Field Programmable Gate Array)	Pxle-1073 Chassis w/ Integrated Mxle Controller (High density, scalable, high speed simultaneous sampling +500KS/s) Pcde Controller Card 5 Peripheral Slot 1 Port PCIe, 3m Cable	National Instruments X Series DAQ cards (USB bus)
	USB-6002 USB-6003 (High speed sampling) USB-6356 (High speed simultaneous sampling) USB-6341 USB-4065 (multifunction measure DAQ, requires 1A instrumental fuse)	
	SCB-68A (w/ Cable SHC68-68-RMIO) SCB-68 HSDIO (w/ Cable SHC68-C68-RDIO2)	
	USB-7846R (R-Series Multifunction RIO w/ Kintex-7 160T) USB-7856R (R-Series Multifunction RIO w/ Kintex-7 160T)	
B. DC Power Supply 1. Low Power (0 - 10A) 2. Medium Power (10-50A) 3. High Power (+50A) - Programmable DC	Ripple - 3mV Max Input AC Selectable Must be mounted in Cabinet	Sola HD SilverLine
	Ripple - 150mV Max Input AC 85-265V Must be mounted in Cabinet	TDK SWS 500L-12
	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
C. Motion Control	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.	

Process and Test Engineering	Global Common / Requirement	Examples
D. I/O Modules	<p>Phoenix AXL F BK ETH - Axioline Communication Module AXL F DI16/1 DO16/1 2H (24Vdc - 16DI & 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 & 16DO I/O Module) 170 ADM 350 10 (24Vdc, 160DI & 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 & 100RPM Max)</p> <p>Interface T25 Series: 20Nm Range 10V analog output option</p>

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

4. Machine Pneumatic Components

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NOTE: Where an approved supplier is followed by "(Special Applications)," these components may be used but require the Fluid Power Engineer's prior approval.

NOTE: All components shall be pre-lubricated for life by the manufacturer. Actuators or valves requiring additional line lubrication require advance written approval.

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

NOTE: Changes since the last revision are highlighted

Machine Pneumatic Components	Global Common / Requirement	Examples
A. Accessories		
1. Thread Sealants	NOTE: For use on tapered threads only. NOTE: RTV, Teflon tape, and horsehair sealants shall NOT be used. Loctite PST 2087067 or 577	
2. Storage Tanks	ASME Pressure Vessel Code - Division 1, Section VIII - R2004 (NA) 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	
3. Vacuum Devices		
a) Motor-Operated	Busch High Vacuum Gast Low Vacuum	
b) Air-Operated	Festo VN OVEM NOTE: With blow off, with or without display. SMC ZH ZL112A-DBL ZL112A-DBL-Q ZM1 *1H- *5LZ-E17	
4. Flow Meter		
a) Electronic		
1) Test	Hastings HFM Series	
2) General	Hedland SMC PFM Series (Special Applications) PF2A Series (Special Applications)	

Machine Pneumatic Components	Global Common / Requirement				Examples
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					
a) China	Festo 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 SMC G36-P10-01-X30 (C) 1 MPa / 145 PSI 1/8 BSPT 162835				
a) All Other Regions	PSI / Bar 2.5 % accuracy or less				Festo MA-40-10-1/8-EN 1/8 BSPT 162835 MA-50-10-1/4-EN 1/4 BSPT 162838 SMC G36-P10-01-X30 1/8 BSPT
2) Push-In for Sandwich Regulator					
a) China	Festo PAGN-26-1M-P10 (C) 1 MPa 563736 PAGN-40-1M-P10 (C) 1 MPa 563738				
a) All Other Regions	PSI / Bar 4.0 % accuracy or less				Festo PAGN-26-10-P10 543488 PAGN-40-10-P10 548009
3) Test	4.25" Diameter, PSI/Bar, NPT, 0.25% Accuracy NIST Traceability paperwork required				Helicoid Ashcroft
b) Gauge adapter	NOTE: 12 x 1.5 connection is required Schroeder S1215DCNPT14 1/4 NPT				
c) Pressure tap, Test Port	NOTE: 12 x 1.5 connection is required Schroeder S1215G14WDP 1/4 G				
6. Muffler, Exhaust, Silencer	BSPT < 80dBa NOTE: Bronze or plastic sintered and paper elements are not allowed. NOTE: Festo mufflers containing plastic sintered, or paper elements are not allowed.				Numatics M1MB 1/8 BSPT M2MB 1/4 BSPT M3MB 3/8 BSPT M4MB 1/2 BSPT M5MB 3/4 BSPT M6MB 1 BSPT M6MB 3/4 NPT M6MN 1 NPT Alwitco 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

Machine Pneumatic Components	Global Common / Requirement				Examples
7. Safety Rated Manual Blow Gun	OSHA 1910.242(b)				Exair 1697-PEEK-12-CS For retrofitting an existing 1697, PEEK with a 12" extension and chip shield, use: 938812 (extension) 900453 (coupler 1/8") 901221 (chip shield) GUARDIAR, WHISPERJET 80LJ012AA
B. Actuators	Standard stroke lengths only Double-acting only NOTE: Spring loaded cylinders are special applications NOTE: FK rod aligner required on guided applications				
1. Linear with Male Rod End(s)					
a) Compact	ISO 21287				
1) Single Rod	Festo ADN-25-* -A-P-A M5 ADN-50-* -A-P-A 1/8 G ADN-63-* -A-P-A 1/8 G ADN-100-* -A-P-A 1/8 G		SMC CD55B25-*M M5 CD55B50-*M 1/8 G CD55B63-*M 1/8 G CD55B100-*M 1/8 G		
2) Double Rod	Festo ADN-25-* -A-P-A-S2 M5 ADN-50-* -A-P-A-S2 1/8 G ADN-63-* -A-P-A-S2 1/8 G ADN-100-* -A-P-A-S2 1/8 G				
3) Single Rod - Non-Rotating	Festo ADNGF-50-* -P-A 1/8 G ADNGF-63-* -P-A 1/8 G ADNGF-100-* -P-A 1/8 G		SMC CDQMB50TF-* 1/4 G CDQMB63TF-* 1/4 G CDQMB100TF-* 3/8 G		
4) Double Rod - Non-Rotating	Festo ADNGF-50-* -P-A-S2 1/8 G ADNGF-63-* -P-A-S2 1/8 G ADNGF-100-* -P-A-S2 1/8 G				
ISO 21287 (Special Applications)	Festo High Force ADNH-25-* -A-P-A-*N ADNH-40-* -A-P-A-*N ADNH-63-* -A-P-A-*N ADNH-100-* -A-P-A-*N				
b) 12-25mm Bore	ISO 6432				
1) Single Rod	Festo DSNU-12-* -P-A M5 DSNU-25-* -PPV-A 1/8 G		SMC CD85N12-*C-B M5 CD85N25-*C-B 1/8 G		
2) Double Rod	Festo DSNU-12-* -P-A-S2 M5 DSNU-25-* -PPV-A-S2 1/8 G		SMC CD85WE12-* -B M5 CD85WE25-*C-B 1/8 G		
c) 32-100mm Bore	ISO 15552 NOTE: Linear with male rod end(s) Festo FNC, HNC, or SNBC mounting bracket required. NOTE: Male rod ends whenever possible. NOTE: Pneumatic cushioning on both ends.				

Machine Pneumatic Components	Global Common / Requirement				Examples
1) Single Rod	Festo		SMC		
	DSBC-32-* -PPVA-N3	1/8 G	CP96SDB32-*C	1/8 G	
	DSBC-50-* -PPVA-N3	1/4 G	CP96SDB50-*C	1/4 G	
	DSBC-63-* -PPVA-N3	3/8 G	CP96SDB63-*C	3/8 G	
	DSBC-80-* -PPVA-N3	3/8 G	CP96SDB80-*C	3/8 G	
	DSBC-100-* -PPVA-N3	1/2 G	CP96SDB100-*C	1/2 G	
2) Double Rod	Festo		SMC		
	DSBC-32-* -T-PPVA-N3	1/8 G	CP96SDB32-*CW	1/8 G	
	DSBC-50-* -T-PPVA-N3	1/4 G	CP96SDB50-*CW	1/4 G	
	DSBC-63-* -T-PPVA-N3	3/8 G	CP96SDB63-*CW	3/8 G	
	DSBC-80-* -T-PPVA-N3	3/8 G	CP96SDB80-*CW	3/8 G	
	DSBC-100-* -T-PPVA-N3	1/2 G	CP96SDB100-*CW	1/2 G	
d) Vertical Load Holding	<p>NOTE: Applications where loads are greater than 35lbs and less than 100lbs. The use of pneumatics to support loads greater than 100lbs is discouraged.</p> <p>NOTE: Where loss of a brake function can create a safety issue, damage tooling, or create a bad part, the brake shall be monitored by a pressure switch or a valve with a spool position sensor.</p>				
1) Rod lock	<p>SMC</p> <p>C96NDB-*C (with Rod Brake)</p> <p>NOTE: Use IFM bracket E11797 and IFM MK5101 T-Slot prox sensor.</p> <p>NOTE: C96N brakes are rated for static holding and dynamic stopping.</p>				
2) Rail Lock	<p>Zimmer Group</p> <p>MBPS (Safety Applications - Rated for dynamic stopping)</p> <p>MKS (Non-Safety Applications - Not rated for dynamic stopping)</p>				
3) Round Bar Lock	<p>Zimmer Group</p> <p>RBPS (Safety Applications - Rated for dynamic stopping)</p> <p>MKRS (Non-Safety Applications - Not rated for dynamic stopping)</p>				
2. Linear (rodless)					
a) 8-63mm Bore	<p>Festo</p> <p>DGC-K-* -PPV-A-GK-FK (External Guiding required)</p> <p>DGC-* -K-F-PPV-A</p> <p>DGC-* -K-F-YSRW-A-1H-PN</p> <p>(clamping unit, 25-50mm, acceptable only in non-safety related applications)</p> <p>SMC</p> <p>MY1B*TF-***Z (External Guiding required)</p> <p>MY1HT*TF-*L (with recirculating ball bearing guide)</p>				
b) Operator Door Applications	<p>NOTE: Special Application. Refer to Nexteer Auto Door Specification SD-1038.</p> <p>NOTE: Magnetic breakaway, 30lbs or less. Example part number below includes the required floating bracket and foot mount kit.</p> <p>Tolomatic</p> <p>24100222 SK*.* FL FM2</p> <p>*.* = Stroke length in inches</p>				
3. Air Motors	ARO				
4. Slides	<p>Festo</p> <p>DFM-*.* -P-A-KF (for strokes less than 200mm)</p> <p>FENG-*.* -KF (with DSBC cylinder for strokes greater than 200mm)</p> <p>or DFM-*.* -B-PPV-A-KF (Special Applications)</p> <p>DGSL-*.* -PA (high tolerance) (Special Applications)</p> <p>DGST-*.* -PA</p> <p>SLS-*.* -PA</p> <p>SMC</p> <p>MGPL*TF-*Z</p> <p>MXH-*.* -Z</p> <p>MXS*TF-*A</p> <p>CY1SG*TF-*Z (magnetically coupled) (Special Applications)</p>				

Machine Pneumatic Components	Global Common / Requirement	Examples
5. Grippers	<p>NOTE: Due to the greater range of motion, special consideration shall be given during the Machine Risk Assessment for angular grippers if an operator is loading to the gripper.</p> <p>NOTE: The use of single acting grippers (spring return) is a special application and requires prior written approval.</p> <p>NOTE: Robot applications require single acting grippers with spring backup to prevent dropping of parts when electrical or pneumatic power is removed.</p>	
a) 2 Jaw (Parallel)	<p>Festo DHPS-* -A</p> <p>NOTE: Add options 'NO' for spring to open or 'NC' for spring to close</p> <p>HGPD-* -A HGPT-* -A-B</p> <p>NOTE: For HGPD and HGPT series, add options 'G1' for spring to open or 'G2' for spring to close</p> <p>HGPL-* -A-B (Special Applications)</p> <p>SMC MHZ2</p> <p>Schunk PGN-plus</p>	
b) 2 Jaw (Angular)	NOTE: Special Applications	
c) 3 Jaw (Parallel)	<p>Festo DHDS-**-A HGDT-**-A HGDD-**-A (sealed)</p>	
d) Wet Applications	<p>Schunk DPG-plus (linear) DRG – Angular (Special Applications) DPZ-plus (sealed)</p>	
6. Escapements	<p>SMC MIS32TF-*D MIW32TF-*D</p> <p>Festo HPV-*-* -A HPVS-*-* -A</p>	
7. Rotary Actuators	<p>Festo DSM-B DRRD</p> <p>SMC MSQ*A-XF CRB*-* -A</p>	
8. Clamps (manual and pneumatic toggle clamps)	<p>NOTE: Swing clamps are special application and require prior written approval.</p> <p>Destaco Elesa-ganter KIFIX (B)</p>	<p>Destaco 802UE 82L2G-203B800</p> <p>Elesa-ganter 862</p> <p>KIFIX KF-017 DB P</p>
9. Stopper Actuators (shot pin)	<p>Festo DFSP-32-25-S-PA (double acting, spring advance)</p>	
C. Conductors		
1. Hose		

Machine Pneumatic Components	Global Common / Requirement	Examples
a) Sizes 1/4" - 1"		Parker Push-Lok 801 Series
b) Sizes 1-1/4" - 2"		Parker GST II (Series 7092, Red)
2. Velocity Fuse	Ross "Hoze-Fuze" Velocity fuse required on supply inlet of hose 3/4" and larger.	
3. Polyurethane Tubing	6, 10mm tubing sizes only NOTE: Must be suitably protected using nylon spiral wrap and tubing clamps.	
a) Normal Applications	Festo 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) SMC TUH0604B-* (Black) TUH0604BU-* (Blue) TUH1065B-* (Black) TUH1065BU-* (Blue) With KQ2 Series Fittings (G thread)	
b) Welding / High Temperature Applications	Festo 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	Hydro-Craft Hydro-strut Hydro-clamp Hydac HRL, HRS Zsi Stauff
D. Connectors		
1. Fittings	ISO 1179 - BSPP and ISO 228-1 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	Parker B33E Hansen 3000-11B
2) Bubble-Tight	Swagelok "QC" & "QF" Series	

Machine Pneumatic Components	Global Common / Requirement			Examples
c) Polyurethane	Festo QS-G- Quick Star (BSPP thread) SMC KQ2-A			
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)	Cleanliness level to meet ISO 8573-1 Metal Bowl, manual drains only. For standard application general use, the air quality is to meet class 5.5.5.7.4. For sensitive applications, the air quality shall met ISO class 1.3.2 NOTE: Standardize on the 3/4 size whenever possible. NOTE: G 1/8, 1/4, 1/2 and 1" are special applications.			
1. Filters	Festo MS Series - Size 6 NOTE: Festo - Use 3/4" connecting plates with air prep assembly.			
a) Coalescing	NOTE: Special Applications MS6-LFM-1/2-A-U-M -DA 0.01m 527670 MS6-LFM-A 532909			
b) 5 Micron	Festo MS6-LF-1/2-C-U-M 5m 1/2 G 529611 MS6-LFP-C (element) 5m 534499 SMC AF50-F06-8-A 5m AF50P-060S (element) 5m			
c) 40 Micron	Festo MS6-LF-1/2-E-U-M 40m 1/2 G 529619 MS6-LFP-E (element) 40m 534500 SMC AF50-F06-27-40-A 40m AF50P-060S-7-40B (element) 40m			
d) Reclassifier	Festo LFU-1/2 10494 LFPU-1/2 (element) 10496 LFU-1 10495 LFPU-1 (element) 10497			
e) Mounting Bracket	Festo 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 SMC Y600T Y600T-A			
f) Branch Module	Festo MS6-FRM-1/2 529853 MS12-FRM-G 541681			

Machine Pneumatic Components	Global Common / Requirement				Examples
g) 1-1/4" - 1-1/2" NPT	Norgren				
	F17-A0-M1DA	5m	1-1/4 NPTF		
	F17-B01-M1DA	5m	1-1/2 NPTF		
	F17-A00-M3DA	40m	1-1/4 NPTF		
	F17-B01-M3DA	40m	1-1/2 NPTF		
	Festo 535023				
	MS12-LF-AGG-C-U-M	5m	1-1/4 G	535023	
	MS12-LF-AGH-C-U-M	5m	1-1/2 G	535023	
	MS12-LFP-C (element)	5m		537143	
	MS12-LF-AGG-E-U-M H601	40m	1-1/4 G	535023	
	MS12-LF-AGH-E-U-M H602	40m	1-1/2 G	535023	
	MS12-LFP-E (element)	40m		537144	
2. Regulator	NOTE: Lock is required for auto door applications				
a) General Purpose	Festo				
	MS6-LR-AGE-D6-AS	4.35-101 PSI	3/4 G	527663	
	MS6-LR-AGE-D6-MPA-AS (C)	4.35-101 PSI	3/4 G	527663	
	LRVS-D (Lock)			193786	
	SMC				
	AR50K-F06G-B (E) (C)	0.02-0.2 MPa			
b) > 1-1/4" - 2" NPTF	Norgren				
	R17-A00-RGLA	5-125 PSI	1-1/4 NPTF		
	R17-B00-RGLA	5-125 PSI	1-1/2 NPTF		
	Festo				
	MS12-LR-AGG-D6-PSI-LD	5-100 PSI	1-1/4 G		
	MS12-LR-AGG-D6-MPA-LD (C)	0.7 MPa			
	MS12-LR-AGH-D6-PSI-LD	5-100 PSI	1-1/2 G		
	MS12-LR-AGH-D6-MPA-LD (C)	0.7 MPa			
c) Precision	Siemens				
	Model 40				
	Fairchild				
	Model 80				
	SMC				
	ARP40K-F04G-3				
	Festo				
	MS6-LRP-1/4-D4-A8	0.75-36 PSI		538006	
	(Special Applications)				
d) Large Capacity	SMC				
	VEX1 Series				
e) Sandwich ISO 15407/2	Festo				
	VABF-S4-1-R1C2-C-6E			549876	
	Norgren				
	VS2672900-KG10				
f) Sandwich ISO 5599/2	Festo				
	VABF-S2-2-R1C2-C-6, 555771, for 5599/2 series valves. Size 2 and greater only.				
	NOTE: Special Applications				
3. Lubricator					
a) In-Line	Festo D Series				
	LOE-3/4-D-MIDI			162681	
	SMC				
	AL50-F06-8-A (E)				

Machine Pneumatic Components	Global Common / Requirement	Examples
b) Single Point	Master Pneumatic Multi point with M476RP reservoir or similar	
F. Valves		
1. Ball		
a) Manual Actuation	1/4 turn, 150 PSI, WOG (Water, oil or gas), full ported	Festo QH-1/4 G 1/4 9541 QH-3/8 G 3/8 9542 QH-1/2 G 1/2 9543 QH-3/4 G 3/4 9544
b) Pneumatic Actuation	NOTE: Use for high cyclic applications. SVF With Adjustable Stem Seal	
2. Check		
a) In-Line	Festo H-1/4-B 1/4 G 11689 H-1/2-B 1/2 G 11691 SMC AKB02A-02S 1/4 R AKB04A-04S 1/2 R	
b) Pilot Operated	Festo HGL-M5-B M5 530029 HGL-1/8-B 1/8 G 530030 HGL-1/4-B 1/4 G 530031 HGL-3/8-B 3/8 G 530032 HGL-1/2-B 1/2 G 530033	
c) Manual Override	Festo HAB-1/8 1/8 G 184585 HAB-1/4 1/4 G 184586 HAB-3/8 3/8 G 184587 HAB-1/2 1/2 G 184588 Aladco 312501BSPP 1/4 G	
3. Directional (electronically controlled)	ISO 15407/2:2002 (26mm Only) 18mm (Special Applications) 24VDC, Manual Non-locking flush overrides. Must conform to ISO 4414, 7.1 and SD-014, Pneumatic Addendum. Shall conform to ISO 20401:2005(E) and IEC 60947-5-2:2004, Figure D.2	Wiring Configuration for individual Sub-base with M12 connector.
a) Manifold Mount, 5-Way 15407/2, 26mm (Size 01) (*) = Configuration selection code (37 Pin External Pilot only) Up to 22 coils (IP65 or 67)	Festo Discrete Multi-Pin Connector 44E-MP1-P+GO (electrical) 539215 44P-N-X-*B-*ZFV**** (pneumatic) IO-Link Serial Connector 44E-LK-P (electrical) 44P-N-X-K-*BUS*B-* (pneumatic) 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.	

Machine Pneumatic Components	Global Common / Requirement	Examples
Single Solenoid Offset (O)	Festo (VSTA series) VSVA-B-M52-MZD-A1-1T1L 539159	
Double Solenoid (J)	VSVA-B-B52-ZD-A1-1T1L 539156	
Double Solenoid 3 Position (E)	VSVA-B-P53E-ZD-A1-1T1L 539161	
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 (MP1)	VABE-S6-1LT-C-M1-S37 543414	
Manifold End Plate - L (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)	VAMC-S6-CH 541010	
Override Cap (Pkg of 10)		
Vertical Supply Plate, Port 11 (ZU)	VABF-S4-1-P1A3-G14 540171	
Dual 3-Way Valve (K)	VSVA-B-T32C-AZD-A1-1T1L 539150	
(for conveyor stops or 3-way functions)		
(not for standard cylinder control)		
Single Solenoid (with spool monitoring) (SO)	VSVA-B-M52-MZD-A1-1T1L-APP 560724	
Supply plate (K)	VABF-S6-1-P1A6-G12 539230	
Separator plate (US)	VABD-S6-1-P3-C 539228	
(Required for Supply Plate above – Select option K)		
	Aventics (previously known as Numatics)	
Manifold Assembly Kit	G503AVM*300V14X, G503AMM22MA0020, Assembled	
Single Solenoid Offset	R503A2B10MA00F1	
Double Solenoid Detent	R503A2B40MA00F1	
Double Solenoid 3 Position	R503A2B50MA00F1	
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	
Dual 3-Way Valve	R503A2BD0MA00F1	
(for conveyor stops or 3-way functions)		
(not for standard cylinder control)		
	Norgren	
Single Solenoid Offset	VS26S527DF313A	
Double Solenoid Detent	VS26S522DF313A	
Double Solenoid 3 Position	VS26S722DF313A	
Single Sandwich Reg	VS2672900-KG10	
Manifold Sub-base (Sgl)	VS2672503-BGFO	
Manifold Sub-base (Dbl)	VS2672502-BGFO	
Manifold End Plate – Left	VS2672702-KG00 (25 Pin Ext Pilot)	
Individual Sub-base (M12)	VS2672510-BG00	
Blanking Plate	VS2672904-KG00	
25 PIN/5 Meter cable (IP 65 or 67)	V11569-E05	
	SMC	
Manifold Assembly	VV801*-03F-MDO-W1-R-Q	
Single Solenoid Offset	VS8-4-FG-S-3VZR	
Double Solenoid Detent	VS8-4-FG-D-3VZR	
Double Solenoid 3 Position	VS8-4-FJG-D-3VZR	
Single Sandwich Reg. Long (PSI/BAR)	VVS8040-ARB-P-1-X1L	NOTE: SMC long and short regulators must alternate when installed next to each other.
Single Sandwich Reg. 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	

Machine Pneumatic Components	Global Common / Requirement			Examples
Blanking Plate	VVS8040-11A			
26 PIN/5 Meter cable MD3	AXT100-MC26-050			
Circular Connector Housing Asm.	VVQC1000-M26-1			
Vertical Supply Plate	VV801-P-03F			
Supply Block Plate	VV8040-16A			
Tie Rods	VV801-TR- **			
Fanuc robot EE connector	UIUSP-DUP01068			
b) Manifold mount, 5-way 5599/2, 52mm (Size 2)	NOTE: Special Application. Requires written justification and supporting engineering calculations.			
(*) = Configurator selection code Up to 22 coils (IP 65 or 67)	Festo 44E-MP1-P-GO (electrical) 44P-N-X-*D-*ZF**** (pneumatic)		539215	
	NOTE: Each base accommodates 2 valves or 4 addresses.			
Single Solenoid Offset (O)	VSVA-B-M52-MZD-D2-1T1L		560821	
Double Solenoid Detent (I)	VSVA-B-B52-ZD-D2-1T1L		560818	
Double Solenoid 3 Position (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 (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	Festo VL/O-3-1/4 VL/O-3-1/2 VL/O-3-3/4		9984 9983 10049	
Air Pilot with separate solenoid	Festo MFH-3-1/4-S MFH-3-1/2-S MFH-3-3/4-S		7959 7960 11968	
	w/ 24VDC solenoid coil MSFG-24/42-50/60		4527	
	Peter-Paul Leak Test (Special Applications)			
d) Press-Brake/Clutch	Ross 3573A5152W Crossflow with L-G monitor Other sizes (Special Applications) NOTE: Pressure Switch monitoring of lockout indicator (port "L") and pneumatic reset are required.	24VDC	3/4 NPT	
e) Safety Valve	Ross DM1CDB20A31 DM1CDB42A31 DM1CDA54A31 DM1CDA55A31		1/4 G 1/2 G 3/4 G 1 G	

Machine Pneumatic Components	Global Common / Requirement			Examples
f) Proportional Valve	Norgren/Herion XSz Series XSZ-8 1/4 G 2492806.3053.024.00 PSV XSZ-8, DBL-SOL, W/ DIN-B Solenoids & Connectors XSZ-10 1/2 G 2492930.3053.024.00 PSV XSZ-10, DBL-SOL, W/ DIN-B Solenoids & Connectors XSZ-20 3/4 G 2493038.0201.024.00 PSV XSZ-20, DBL-SOL, W/ DIN-A Solenoids & Connectors XSZ-32 1 G 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.			
	NOTE: Special Applications			
	Festo MPYE VPWP Norgren VP60			
	Fairchild 7800 series I/P Rosemount 3051C Emerson High Flow (Special Applications) SMC ITV1050-33F2L4 ITV3050-33F4L5			
4. Flow Control				
a) Meter-In	SMC AS1210-M5 M5 151183 AS2210-G01-X396 1/8 G 151188 AS2210-G02-X396 1/4 G 151195 AS4210-G04-X396 1/2 G Festo GRLZ-M5-B M5 151183 GRLZ-1/8-B 1/8 G 151188 GRLZ-1/4-B 1/4 G 151195			
b) Meter-Out	SMC AS1200-M5 M5 151160 AS2200-G01-X396 1/8 G 151165 AS2200-G02-X396 1/4 G 151172 AS4200-G04-X396 1/2 G 151178 Festo GRLA-M5-B M5 151160 GRLA-1/8-B 1/8 G 151165 GRLA-1/4-B 1/4 G 151172 GRLA-3/8-B 3/8 G 151178 GRLA-1/2-B 1/2 G 151179			

Machine Pneumatic Components	Global Common / Requirement			Examples
c) Meter-In or Meter-Out (In-Line)	SMC AS1000-M5 AS2000-F01 AS2000-F02 AS3000-F03 AS4000-F04	M5 1/8 G 1/4 G 3/8 G 1/2 G		
	(Door Applications) SMC AS2001F-06T ASD330F-01-06ST NOTE: Use SMC AS-T-1 to adjust Tamper-Proof flow controls above.	Tamper-Proof Tamper-Proof		
5. Relief	SME Certified			Watts Jayco
6. Safety Lock-Out with Exhaust	Lockable in the OFF position only			
a) 3/4"	Ross Y1523C5012 Festo HE-N3/4-LO	3/4 NPT 3/4 NPT	197131	
b) 1-1/4" - 2"	Ross Y1523C7012 Y1523C8002 Y1523C9012 Norgren C0022C C0022D	1-1/4 NPTF 1-1/2 NPTF 2 NPTF 1-1/4 NPTF 1-1/2 NPTF		
7. Shuttle	Festo OS-1/4-B	1/4 G	6682	
8. Temperature Control - Air Operated	Powers Accritemp II Rigit Bulb Controller and 593 Flowrite II Control Valve H.O. Terice 87700 Pneumatic Controller with 910 Series Control Valve			
9. Two-Hand, Anti-Tie Down Air logic	NOTE: Special Applications Numatics CSO-0602			
10. Quick Exhaust	NOTE: Quick exhausts are not to be used as a method of decreasing stop distance relating to safeguarding placement. Festo SEU-1/8 SEU-1/4 SEU-3/8 SEU-1/2 VBQF-U-G18-E VBQF-U-G14-E SMC AQ2000-F01 AQ2000-F02 AQ3000-F03 AQ5000-F04 AQ5000-F06	1/8 G 1/4 G 3/8 G 1/2 G 1/8 G 1/4 G 1/8 G 1/4 G 3/8 G 1/2 G 3/4 G	4616 6753 6755 6822 547531 548001	

5. Machine Hydraulic Components

The "Machine Hydraulics Components" column is organized by components. Nexteer Automotive does not have requirements for technologies not listed.

The "Global Common / Requirement" column has two functions:

- 1) Where components are designated, this is the Nexteer Automotive approved (required) component.
 - Where multiple brands 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 is 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 supplier's components may be used.

The "Examples" column lists example components that may be used providing they meet the specifications of the "Global Common / Requirement" column. These example components are readily available in our global regions. Example components are not listed in any preferred order.

NOTE: To identify regional preferences, the following notations is 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 supplier's components may be used.

NOTE: Where an approved supplier is followed by "(Special Applications)," these components may be used but require the Fluid Power Engineer's prior approval.

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

NOTE: Changes since the last revision are highlighted

Machine Hydraulics Components	Global Common / Requirement			Examples	
A. Accessories					
1. Accumulators	NOTE: Region certification required NOTE: Top load required				
a) Bladder Type	Parker VGU/F.25/250.8TS5.3 charge kit required with each machine equipped with accumulator.			Hydac SB330TR	
Australian - AS1210 (B) - ASME or PED (C) - SELO (ASME/PED) (E) - PED, CE (NA) - ASME	ISO4570-8VI or .305-32 fill connector only.			Nacol 210 series 3000 PSI Parker (India) BA-***-T Series	
b) Piston Type (Special Applications)	Tobul A30 Series 3000 PSI				
c) Pulsation / Noise Suppressors	Wilkes and McLean WM 201 BAR				
2. Accumulator Safety Block	Bosch-Rexroth ABZSS, Version E Hydac SAF**E16Y1N250AS**L				
3. Air Breather (3 Micron)	Schroeder ABF-3/10-M-P12 Vickers (by Danfoss) BR-210 Hydac BLBN080G10W				
4. Flow Meter					
a) Electrical (Special Applications)	VSE VS Series				
b) Visual	NOTE: 6000 PSI basic stainless-steel flow meter Hedland H702S - 002 0.2-2.0 GPM 3/4 G H702S - 005 0.5-5.0 GPM 3/4 G H702S - 010 1-10.0 GPM 3/4 G H702S - 020 2-20.0 GPM 3/4 G H702S - 030 3-30.0 GPM 3/4 G				

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Machine Hydraulics Components	Global Common / Requirement				Examples
11. Intensifier	NOTE: Not allowed for severity 8, 9, 10 applications				
a) Air / Oil Double Acting Press	NOTE: Air / Oil presses should be considered over fully pneumatic and hydraulic presses.				
	HyperCyl (NA) HPI HPS HZ HPX NOTE: '-NX' option required. Comes with BSPP ports and with the below. HFP-2 filtered fill unit is required and must be securely attached to each unit along with laminated fill instructions. SKE seal kit must also be included along with a USB detailing repair procedure. OEM to inform local HyperCyl distributor on purchase order that this unit is for Nexteer Automotive to ensure that these items are delivered with the unit. TOX (B) (C) (I) (E) HZL (cylinder) X-ES (intensifier)				NOTE: HyperCyl should be considered for the following applications involving forces between 1,000 lbs. - 200,000 lbs.: - Pressing - Forming - Piercing - Crimping - Bearing installation - many others
b) Continuous Motion Press	Air-Hydraulic Haskel Hytec 100191 100987	400-1500 PSI 925-3325 PSI			
12. Manifolds, Multiple Stations	ISO 4413, 7.3 SD-013, Hydraulic Addendum Steel only				DAMAN Med-Kas Bosch-Rexroth HSR
13. Pump / Motor "C" Face Adapters	SAE J799				Magnaloy BSF
14. Rod Coupler, Self-Aligning	Milwaukee MC Series NOTE: English threads only Parker				
15. Sight Gauge with Thermometer	Lube Devices G615 Series Hydro-Craft HSG-66-T5-w/temp dial Bosch-Rexroth				
16. Shock Absorbers	Ace Enertrols				
17. Sub-Plates or Manifolds	ISO 4413, 7.3 SD-013, Hydraulic Addendum Steel only				Daman Med-Kas Bosch-Rexroth HSR
18. Temperature Control (Water Modulating)	Thermal Transfer 65128 65141 (bulb well) Hydac	55-75 GPM	115F-180F	1 NPT	
19. Water Strainer	Bronze 300 PSI 20 Mesh Stainless Wire Screen				Thermal Transfer 65297 1 NPT
20. Water Flow Indicator					
a) Flapper Sight Indicator	John C. Ernst 142			3/4 NPT	

Machine Hydraulics Components	Global Common / Requirement	Examples
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	Bosch-Rexroth CDT3 (Special Applications) 2320 PSI / 160 BAR CDT4 (NFPA mount only) 2900 PSI / 200 BAR CDH2 3625 PSI / 250 BAR Danfoss Hydro-line HM (6020) 3045 PSI / 210 BAR IHM (6020) 3045 PSI / 210 BAR Parker MMA (6022) HMI	
b) < 25mm Bore	Aurora Tom Thumb – EH Parker	
2. Motors (hydraulic)	Vickers (by Danfoss) Char-Lynn series Bosch-Rexroth A4FM	
3. Rotary Actuators		
a) Vane	Parker Tork-Mor Series	
b) Cylinder	PHD Moog Flo-Tork	
4. Clamps	Vektek Enerpac	
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"		Parker 787TC - with 77 series fittings
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

Machine Hydraulics Components	Global Common / Requirement	Examples
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	Hydro-Craft Hydro-Strut Hydro-Clamp Zsi Stauff Hydac HRL HRS
D. Connectors	ISO 1179-BSPP	
1. Fittings		
a) Needle Valve	BSPP	Parker NS
b) Disconnect, Quick	MIL-C-25427A (valved both sides)	Hansen Aeroquip FD-56
c) Disconnect, Quick Fill Point	Parker 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)	Parker Seal-Lok or Parflange
e) Swivel, Rotary Union	Dueblin Aeroquip Single Connection Carr-Lane 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.	
a) Pressure	Pall, Schroeder, or Hydac elements only.	Schroeder KF30, KF50, KC50, KFH50, MKF50 Pall 9660, 9710 Hydac HF3P, HF4P

Machine Hydraulics Components	Global Common / Requirement	Examples
b) Return	Pall, Schroeder, or Hydac elements only	Schroeder RT, TF3, KF3, KFH50, KTK, KTF Pall 8800, 8900, 6300, 6400 Hydac HF4R
2. Heat Exchanger		
a) Air – Oil	Thermal Transfer (Special Applications) RM-*-*-43 Bosch-Rexroth KOL (Special Applications) Hydac	
b) Water – Oil	Thermal Transfer EKM-*-*-R EKFM-*-*-R ITT Standard BCF Hydac HEX***-**CB*	
c) Chiller (Water Glycol)	Hydac RFCS-BL-****/1.0/W/***-**-*/A/1/FM/000 Kelvin Koolant Coolers Daikin	
F. Values		
1. Air Bleed	Vickers (by Danfoss) ABS Hydac AEV-6/12	
2. Ball		
a) Low Pressure	Pump inlet, 400 PSI, full port, ¼ turn	DMIC BVAL-0250B-4323 1/4 G BVAL-0375B-4323 3/8 G BVAL-0500B-4323 1/2 G BVAL-0750B-4323 3/4 G BVAL-1000B-4323 1 G BVAL-1250B-4323 1-1/4 G BVAL-1500B-4323 1-1/2 G
b) High Pressure	Up to 6000 PSI, full port, ¼ turn	DMIC BVH-0250B-1113 1/4 G BVH-0375B-1113 3/8 G BVH-0500B-1113 1/2 G BVH-0750B-1113 3/4 G BVH-1000B-1113 1 G BVH-1250B-1113 1-1/4 G BVH-1500B-1113 1-1/2 G

Machine Hydraulics Components	Global Common / Requirement		Examples
3. Gauge Isolator 4. Check a) In-Line or Gasket-Mounted b) Pilot Operated 5. Directional a) Cartridge, Screw-In b) Cartridge, Slip-In c) Deceleration and Feed (Special Applications) d) Four-Way 1) D03 – ISO 4401 a) Single Solenoid Spring Return b) Double Solenoid Detented (Special Applications)			Hydac KHB-G1/4-1114-01X-A 1/4 G KHB-G3/8-1114-01X-A 3/8 G KHB-G1/2-1114-01X-A 1/2 G KHB-G3/4-1114-01X-A 3/4 G KHB-G1-1114-01X-A 1 G KHM-G11/4-1114-01X-A 1-1/4 G KHM-G11/2-1114-01X-A 1-1/2 G KHM-G2-1114-01X-A 2 G
	Parker 9GT400SV Hydac MS4 or MS6		
	Bosch-Rexroth S, MS-R Parker 9C		
	Parker		
	NFPA/T3.5.50-200x		Vickers (by Danfoss) Bosch-Rexroth Continental - Command Controls components only. SUN products are not permitted.
	ISO 7368 (24342)		Vickers (by Danfoss) Bosch-Rexroth
	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.
	Vickers (by Danfoss) DG4V-3-2A-M-FPM4WL-D7-H7-60-EN623 30W Bosch-Rexroth 4WE6D6X/EG24N9DK35L/62=AN 30W Continental VSD03M-1A-GBD4-70L-C 24W		
	Vickers (by Danfoss) DG4V-3-2N-M-FPM4WL-D7-H7-60-EN623 30W Bosch-Rexroth 4WE6D6X/OFEG24N9DK35L/62=AN 30W Continental VSD03M-2A-GBD4-70L-C 24W		

Machine Hydraulics Components	Global Common / Requirement	Examples
c) Double Solenoid Spring Center Float Spool A&B to T	<p>NOTE: Blocked center is not permitted.</p> <p>Vickers (by Danfoss) DG4V-3-6C-M-FPM4WL-D7-H7-60-EN623 30W</p> <p>Bosch-Rexroth 4WE6J6X/EG24N9DK35L/62=AN 30W</p> <p>Continental VSD03M-3F-GBD4-70L-C 24W</p>	
d) Valves with Monitored Spool Positions (for Safety Applications)	<p>Vickers (by Danfoss) DG4V3-2A-M-S4-FPA5WL-H-2-60</p>	
e) Safety Manifold (BSPP, w/M5x.8 Metric Bolt)	<p>MED-KAS 29902</p> <p>Continental IC-0302-XXX-D-M-1317</p>	
f) Bubble Tight for Use with Air Over Oil Applications	<p>Hawe Single solenoid, Spring Offset NBVP 16 W-G24 30W 3 Pos., Spring Centered, A&B-T NBVP 16 D-G24 30W</p>	
2) D05 ISO 4401		
a) Single Solenoid Spring Return	<p>Vickers (by Danfoss) DG4V4-012A-M-PM4WL-D7-HL-4-10-S607</p> <p>Bosch-Rexroth 4WE10D4X/CG24N9DK35L=AN</p> <p>Continental VSD05M-1A-GBD4-70L-C</p>	
b) Double Solenoid Detented (Special Applications)	<p>Vickers (by Danfoss) DG4V4-012N-M-PM4WL-D7-H-4-10-S607</p> <p>Bosch-Rexroth 4WE10D4X/OFCG24N9DK35L=AN</p> <p>Continental VSD05M-2A-GBD4-70L-C</p>	
c) Double Solenoid Spring Center Float Spool A&B to T	<p>NOTE: Blocked center is not permitted.</p> <p>Vickers (by Danfoss) DG4V4-016C-M-PM4WL-D7-H-4-10-S607</p> <p>Bosch-Rexroth 4WE10J4X/CG24N9DK35L=AN</p> <p>Continental VSD05M-3F-GBD4-70L-C</p>	
d) Valves with Monitored Spool Positions for Safety Applications	<p>ATOS DKE-1631/2/A/FV-X24VDC 36W 1NO/1NC Monitoring contact</p>	
Safety Manifold, BSPP w/M6x1 Metric Bolt	<p>MED-KAS 29903</p> <p>Continental IC-0502-XXX-D-M-1317</p>	

Machine Hydraulics Components	Global Common / Requirement	Examples
e) Proportional	<p>NOTE: Euro or integral cards only</p> <p>Vickers (by Danfoss) K(B)SDG4V-3, 1* Series KBSDG4V-5, 1* Series</p> <p>Bosch-Rexroth 4WREE 4WRKE</p> <p>Continental VED03M PowerFlow Series</p>	
f) Two / Three-Way, In-Line (Special Applications)	<p>Vickers (by Danfoss) SV1-10-C-3G-24DG (2-way) SV1-10-3-3G-24DG (3-way)</p> <p>Bosch-Rexroth VEPS KKDSR1</p> <p>Continental CEMDV-1*-C5-B-M12</p> <p>Oilgear High Flow Applications</p>	
6. Flow Control and Needle		
a) Standard Adjustable	<p>DMIC FC1H-****B</p> <p>Parker 9F****S, 9N****S</p>	
b) Compensated	<p>Vickers (by Danfoss) FCG-03-28-22-S10</p> <p>Continental F12M-***-G-F</p>	
c) Proportional (Special Applications)	<p>Bosch-Rexroth Vickers (by Danfoss) Continental</p>	
7. Modular, Stacking	<p>NOTE: Steel bodies only</p> <p>Bosch-Rexroth Vickers (by Danfoss) Continental PowerFlow Series</p>	
a) Pressure Reducing / Relieving	<p>Bosch-Rexroth 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>Vickers (by Danfoss) Continental PowerFlow Series</p>	

Machine Hydraulics Components	Global Common / Requirement	Examples
b) Relief	Bosch-Rexroth D03 (P to T) ZDB6VP2-4X/100V 1450 PSI / 100 BAR ZDB6VP2-4X/200V 2900 PSI / 200 BAR D05 (P to T) ZDB10VP2-4X/100V 1450 PSI / 100 BAR ZDB10VP2-4X/200V 2900 PSI / 200 BAR Vickers (by Danfoss) Continental PowerFlow Series	
c) Flow Control	Bosch-Rexroth D03 Z2FS6-2-4X/2QV, (A and B - Meter-in or out) D05 Z2FS10-5-3X/V, (A and B - Meter-in or out) Vickers (by Danfoss) Continental PowerFlow Series	
d) Pilot Operated Check	Bosch-Rexroth D03 Z2S6-1-6X/V, (A and B line) D05 Z2S10-1-3X/V, (A and B line) Vickers (by Danfoss) Continental Command Controls	
8. In-Line Relief	Bosch-Rexroth Vickers (by Danfoss) Continental Command Controls	
9. Servo (Special Applications)	Bosch Rexroth Vickers (by Danfoss) SM4 series Moog 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. (Special Applications) Contact Controls Engineer for other options.
2. Compact - Energy Savings	NOTE: Incoming Power must be 200 – 220VAC Daikin 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 (Special Applications)		

Machine Hydraulics Components	Global Common / Requirement	Examples
4. Standard (Special Applications)	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	Parker DMIC DPG Bosch-Rexroth AZP	
2. Piston – Axial	Bosch-Rexroth AA10VSO18DRG/31RVKC62N00 8GPM R902502752 Oilgear PVWJ A-FRAME PVWJ-011-A1UV-RSAY-P-1NNNN 4 GPM PVWJ-011-A1UV-RSAY-P-1NNNN 4 GPM PVWJ-014-A1UV-RSAY-P-1NNNN 6 GPM PVWJ-014-A1UV-RSAY-P-1NNNN 6 GPM PVWJ-022-A1UV-RSAY-P-1NNNN 10 GPM PVWJ-022-A1UV-RSAY-P-1NNNN 10 GPM Bosch-Rexroth AA10VSO45DR/31RVKC62N00 20 GPM R902502741 Oilgear PVWJ B-FRAME PVWJ-025-A1UV-RSFY-P-1NNNN 11 GPM PVWJ-025-A1UV-RSFY-P-1NNNN 11 GPM PVWJ-034-A1UV-RSFY-P-1NNNN 15 GPM PVWJ-034-A1UV-RSFY-P-1NNNN 15 GPM PVWJ-046-A1UV-RSFY-P-1NNNN 20 GPM PVWJ-046-A1UV-RSFY-P-1NNNN 20 GPM Bosch-Rexroth AA10VSO71DR/31RVKC92N00 32 GPM R902502701 Oilgear PVWJ C-FRAME PVWJ-064-A1UV-RSFY-P-1NNNN 25 GPM PVWJ-064-A1UV-RSFY-P-1NNNN 25 GPM PVWJ-076-A1UV-RSFY-P-1NNNN 34 GPM PVWJ-076-A1UV-RSFY-P-1NNNN 34 GPM Bosch-Rexroth AA10VSO100DR/31RVKC62N00 45 GPM R902502997 Oilgear (C-Frame) PVWJ-098-A1UV-RSFY-P-1NNNN 45 GPM PVWJ-098-A1UV-RSFY-P-1NNNN 45 GPM Bosch-Rexroth AA10VSO140DR/31RVKD62N00 63 GPM R902503003 Oilgear (C-Frame) PVWJ-130-A1UV-RSFY-P-1NNNN 60 GPM PVWJ-130-A1UV-RSFY-P-1NNNN 60 GPM Vickers (by Danfoss) PVM (Special Applications)	
3. Screw	IMO	
4. Vane	Bosch-Rexroth VPV	

Machine Hydraulics Components	Global Common / Requirement	Examples
a) Fixed Delivery	Vickers (by Danfoss) 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)	Bosch-Rexroth 0513R18C3 VPV16SM21HYB03 Continental PVX-8B-30-RF-P-1S-17-A/-BSPP	
2) 11 GPM @ 1800 RPM (325 – 3000 PSI)	Bosch-Rexroth 0513R18C3VPV25SM21HYB0B04 Continental PVX-11B-30-RF-P-1S-17-A/-BSPP	
3) 15 GPM @ 1800 RPM (325 – 3000 PSI)	Bosch-Rexroth 0513R18C3VPV32SM21HYB0B04 Continental PVX-15B-30-RF-P-1S-17-A/-BSPP	
4) 20 GPM @ 1800 RPM (325 – 3000 PSI)	Bosch-Rexroth 0513R18C3 VPV63SM21HYB05 Continental PVX-20B-30-RF-P-5S-17-A /-BSPP	
5) 29 GPM @ 1800 RPM (325 – 3000 PSI)	Bosch-Rexroth 0513R18C3VPV45SM21HYB0B05 Continental PVX-29B-30-RF-P-5S-17-A /-BSPP	
6) 36 GPM @ 1800 RPM (325 – 3000 PSI)	Bosch-Rexroth 0513R18C3 VPV80SM21HYB05 Continental PVX-36B-30-RF-P-5S-17-A /-BSPP	
7) 46 GPM @ 1800 RPM (325 – 3000 PSI)	Bosch-Rexroth 0513R18C3 VPV100SM21HYB04 Continental PVX-46B-25-RF-P-5S-17-A /-BSPP	
8) 60 GPM @ 1800 RPM (325 – 3000 PSI)	Bosch-Rexroth 0513R18C3 VPV130SM21HYB04 Continental PVX-60B-25-RF-P-5S-17-A /-BSPP	
9) 75 GPM @ 1800 RPM (325 – 3000 PSI)	Bosch-Rexroth 0513R18C3 VPV164SM21HYB04 Continental PVX-75B-25-RF-P-5S-17-A /-BSPP	

6. Lubrication Components

The "Lubrication Components" column is organized by components. Nexteer Automotive does not have requirements for technologies not listed.

The "Global Common / Requirement" column has two functions:

- 1) Where components are designated, this is the Nexteer Automotive approved (required) component.
 - Where multiple brands 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 is 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 supplier's components may be used.

The "Examples" column lists example components that may be used providing they meet the specifications of the "Global Common / Requirement" column. These example components are readily available in our global regions. Example components are not listed in any preferred order.

NOTE: To identify regional preferences, the following notations is 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 supplier's components may be used.

NOTE: Where an approved supplier is followed by "(Special Applications)," these components may be used but require the Fluid Power Engineer's prior approval.

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

NOTE: Reference GM LS-1 (GM 1720, Version 5.0, Jan 2015) and GM LS-2 (GM 1721, Version 6, Jan 2011) for proper application and fluid selection. Contact the Nexteer Automotive Controls Engineer to obtain the non-productive lubricant specification for machine tool lubricants, and the GM LS-2 product approval and cross reference listing. GM LS-1 and GM LS-2 are available at <https://www.nexteerdtaexchange.com/>.

NOTE: Changes since the last revision are highlighted

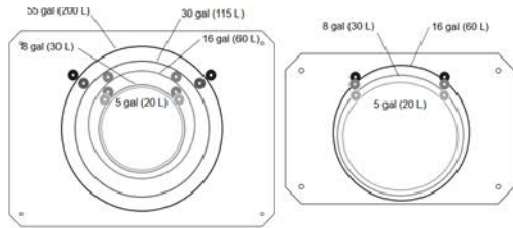
Machine Lubrication

Lubrication Components	Global Common / Requirement				Examples
A. Accessories					
1. Regulator (Mastic)	GP Reeves	<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	
	NOTE: Grease only. Not for use with RTV or material with Teflon.				
	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	
	NOTE: For high flow and thick materials, including Teflon based materials.				
	ARO				
	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	
	NOTE: Use C1B for high flow and thick materials				
	Dopag (piston)				
	Large Body (ID12)				
	450.00.11	3625 PSI	87-725 PSI	1/2 G	
	450.00.12	3625 PSI	217-2175 PSI	1/2 G	
	Medium Body (ID8)				
	450.00.10	3625 PSI	87-725 PSI	3/8 G	
	Small Body (ID4)				
	450.00.00	3625 PSI	87-725 PSI	1/4 G	
	Dopag (diaphragm)				
	402.25.30	3625 PSI	145-2175 PSI	1/2 G	
	402.25.60	3625 PSI	58-725 PSI	1/2 G	
	400.26.56				
	NOTE: Use for abrasive or thick and Teflon materials				
2. High pressure flexible lines for lubrication applications	Parker				
	NN4X.65				
	NN6X1				
	With brass compression fittings				
	Graco				
	17S556				
	with 17R56" BSPT Fittings				

Lubrication Components	Global Common / Requirement				Examples
3. Relief	Graco (grease) (750 PSI) 563163 (1000 PSI) 563164 (1250 PSI) 563165 (1500 PSI) 563166 (2000 PSI) 563167 (2500 PSI) 563168 (3000 PSI) 563169 Graco (air) (50 PSI) 214691 (60 PSI) 110065 (75 PSI) 108124				
4. Block Cycle Indicator (M12)	Graco 17L983				
5. Pressure Switch	Graco P1=557829				
B. Lubrication System	Graco MPP-T*-BSPP-A3-G3-L*-P1 MPP-GP*-BSPP-A3-G3-L*-P1				
C. Pumps	Graco ALS-25M 563306 with BSPP base plate 563357				
E. Divider Values	Graco MSP Series (BSPP connections only)				
F. Filters	Facet 569022-01 Gitz 1633-037801 Hydrocraft HCBP-8				
2. Fill Filter Assembly (Oil)	Graco 563095 10m				
3. Line Filter					
a) Low Pressure (Oil)	Graco 563095 10m 200 PSI 3/4 NPT 563093 (element)				
b) High Pressure (Oil) Spin On	Graco 564004 10m 3000 PSI 3/4 G 556031 (element)				
c) High Pressure (Oil) Block	Graco 563516 10m 7500 PSI 1/4 G 563509 (element)				
d) High Pressure (Grease) Block Strainer	Graco 564406 149m 7500 PSI 1/4 G 557700 (element)				

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Lubrication Components	Global Common / Requirement				Examples
b) Lockable	Lockable in the OFF position only.				DMIC 6000 PSI BVH-0250B-11118ZZA 1/4 G BVH-0375B-11118ZZA 3/8 G BVH-0500B-11118ZZA 1/2 G BVH-0750B-11118ZZA 3/4 G BVH-1000B-11118ZZA 1 G NOTE: The '8' indicates lockable handle in the OFF position only.
5. High Pressure Grease Strainer					
a) 149 micron, 100 mesh	GP Reeves				
	GF1149-4	3000 PSI	1/4 NPT		
	GF1149-6	3000 PSI	3/8 NPT		
	GF1149-8	3000 PSI	1/2 NPT		
	GF1149-12	3000 PSI	3/4 NPT		
	KA10393A (element)				
	Graco				
	564406	7500 PSI	1/4 G		
	557700 (element)				
	Dopag		<u>Inlet</u>	<u>Outlet</u>	
	401.41.03	7250 PSI	3/4 G	3/8 G	
	401.41.07	7250 PSI	1/2 G	3/8 G	
	401.40.18 (element)				
b) 420 micron, 40 mesh	GP Reeves				
	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		
	KA10394A (element)				
c) 250 micron, 60 mesh	Dopag				
	401.41.02	7250 PSI	3/4 G	3/8 G	
	401.41.06	7250 PSI	1/2 G	3/8 G	
	401.40.17 (element)				
B. Pumps	Graco				
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.	Contact Fluid Power Engineer for acceptable pump part numbers.				
	PVA (Gap Fill applications)				
	PVA-1GPU				
	PVA-5GPU				
	GP Reeves (NA)				
NOTE: Grease pressures shall be limited to a maximum of 3000 PSI.	Each GPReeves pump option includes the items below. Additional items maybe included.				
NOTE: Double barrel pumps are a special application and only to be used with prior approval.	See pump options below for clarification.				
	- Control panel				
	- Stack light				
	- Low level and empty sensors				
	- ISO solenoid valve for pump ON/OFF control				
	- ISO solenoid valve for ram ON/OFF control				
	- ISO solenoid valve for depressurization (relief)				
	- 35-minute idle timer				
	Pump motor				
	- Samoa 20:1 pump option for Lithium and Calcium based materials.				
	For use in all locations except China.				
	- ARO 22:1 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.				
	- ARO 43:1 pump for thicker materials such as Crevseal and RTV.				
	For use in all locations.				
	<u>Option 40NX</u>				
	Used to supply single machines.				

Lubrication Components	Global Common / Requirement				Examples																																																																																					
	<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">- Ethernet switch- Cognex Scanner <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">- PLC- Ethernet switch <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">- PLC- Ethernet switch- Cognex Scanner																																																																																									
1. Container Size	<p>NOTE: The following barrel sizes are considered special application and are not permitted without prior written approval:</p> <ul style="list-style-type: none">- 6 Gallon (16L)- 8 Gallon (30L)- 16 Gallon (60L)- 30 Gallon (115L)																																																																																									
																																																																																										
a) 55 Gallon Barrel	<table><tr><td></td><td></td><td></td><td><u>Max Flow</u></td><td><u>Max Output Pressure</u></td></tr><tr><td><u>Option 40NX</u></td><td></td><td></td><td></td><td></td></tr><tr><td>GDP20-400I2-40NX</td><td>Samoa 20:1</td><td>2100 cc/min</td><td>3000 PSI @ 150 PSI air</td><td></td></tr><tr><td>GDP22-400I2-40NX</td><td>ARO 22:1</td><td>1500 cc/min</td><td>2200 PSI @ 100 PSI air</td><td></td></tr><tr><td>GDP43-400I2-40NX</td><td>ARO 43:1</td><td>2800 cc/min</td><td>4300 PSI @ 100 PSI air</td><td></td></tr><tr><td><u>Option 41NX</u></td><td></td><td></td><td></td><td></td></tr><tr><td>GDP20-400I2-41NX</td><td>Samoa 20:1</td><td>2100 cc/min</td><td>3000 PSI @ 150 PSI air</td><td></td></tr><tr><td>GDP22-400I2-41NX</td><td>ARO 22:1</td><td>1500 cc/min</td><td>2200 PSI @ 100 PSI air</td><td></td></tr><tr><td>GDP43-400I2-41NX</td><td>ARO 43:1</td><td>2800 cc/min</td><td>4300 PSI @ 100 PSI air</td><td></td></tr><tr><td><u>Option 73NX</u></td><td></td><td></td><td></td><td></td></tr><tr><td>GDP20-400I2-73NX</td><td>Samoa 20:1</td><td>2100 cc/min</td><td>3000 PSI @ 150 PSI air</td><td></td></tr><tr><td>GDP22-400I2-73NX</td><td>ARO 22:1</td><td>1500 cc/min</td><td>2200 PSI @ 100 PSI air</td><td></td></tr><tr><td>GDP43-400I2-73NX</td><td>ARO 43:1</td><td>2800 cc/min</td><td>4300 PSI @ 100 PSI air</td><td></td></tr><tr><td><u>Option 74NX</u></td><td></td><td></td><td></td><td></td></tr><tr><td>GDP20-400I2-74NX</td><td>Samoa 20:1</td><td>2100 cc/min</td><td>3000 PSI @ 150 PSI air</td><td></td></tr><tr><td>GDP22-400I2-74NX</td><td>ARO 22:1</td><td>1500 cc/min</td><td>2200 PSI @ 100 PSI air</td><td></td></tr><tr><td>GDP43-400I2-74NX</td><td>ARO 43:1</td><td>2800 cc/min</td><td>4300 PSI @ 100 PSI air</td><td></td></tr></table>							<u>Max Flow</u>	<u>Max Output Pressure</u>	<u>Option 40NX</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		
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Lubrication Components	Global Common / Requirement	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>GP Reeves</div> <table><tr><td>GPMD3000-.60 -02-03</td><td>0.05 - 0.60 cc</td><td>Max Inlet</td><td>600-3000 PSI</td><td></td></tr><tr><td>GPMD3000-2-02-03</td><td>0.15 - 2.0 cc</td><td></td><td>400-3000 PSI</td><td></td></tr><tr><td>GPMD3000-9-02-03</td><td>0.35 - 9 cc</td><td></td><td>400-3000 PSI</td><td></td></tr><tr><td>GPMD3000-20-02-03</td><td>5 - 20 cc</td><td></td><td>400-3000 PSI</td><td></td></tr></table> <div>NOTE: 10000 Series dispensers are not permitted.</div> <table><tr><td>Dopag</td><td></td><td>Max Inlet</td><td>Inlet</td><td>Outlet</td></tr><tr><td>450.20.03</td><td>0.003 - 0.2mL</td><td>725 PSI</td><td>1/4 G</td><td></td></tr></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><tr><td>1029662 (replaced 450.10.06)</td><td>0.05 - 0.5mL</td><td>1160 PSI</td><td>1/8 G</td><td></td></tr><tr><td>1023208 (replaced 450.10.07)</td><td>0.1 - 3.0mL</td><td>1160 PSI</td><td>1/8 G</td><td>1/8 G</td></tr><tr><td>415.12.21</td><td>0.5 - 12mL</td><td>2175 PSI</td><td>1/8 G</td><td></td></tr></table>	GPMD3000-.60 -02-03	0.05 - 0.60 cc	Max Inlet	600-3000 PSI		GPMD3000-2-02-03	0.15 - 2.0 cc		400-3000 PSI		GPMD3000-9-02-03	0.35 - 9 cc		400-3000 PSI		GPMD3000-20-02-03	5 - 20 cc		400-3000 PSI		Dopag		Max Inlet	Inlet	Outlet	450.20.03	0.003 - 0.2mL	725 PSI	1/4 G		1029662 (replaced 450.10.06)	0.05 - 0.5mL	1160 PSI	1/8 G		1023208 (replaced 450.10.07)	0.1 - 3.0mL	1160 PSI	1/8 G	1/8 G	415.12.21	0.5 - 12mL	2175 PSI	1/8 G		
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2) Bead	<div>Dopag</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>Viscotec</div> <div>viproPUMP100 VisLas, viproPUMP_7</div> <div>B-KC-Viscopro-C (controller, includes 5m cable)</div>																																														
3) Spray, Stream	<div>(Special Applications – prior written approval and development required)</div> <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>Glob, Dab or Shot</div> <div>GP Reeves</div> <div>AA1 (pneumatic)</div> <div>Bead</div> <div>GP Reeves</div> <div>AA8 (servo)</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>Standalone Detection Package</div> <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>GP Reeves</div> <div>GUS *****-ST-CT8-DIP</div> <div>GUS *****-FL-CT8-DIP</div> <div>Pump with Detection Package (GUS)</div> <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>GP Reeves</div> <div>SP20_35A6-GUS*****-FL2-CT8-DIP</div> <div>SP22_35A6-GUS*****-FL2-CT8-DIP</div>																																														

Lubrication Components	Global Common / Requirement	Examples
2. RTV		
a) Dispense Type		
1) Glob, Dab, or Shot	Dopag <div> <div>450.20.03</div> <div>0.003 – 0.2 mL</div> <div>Max Inlet 725 PSI</div> <div>Max Inlet 1/4 G</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>1029662 (replaced 450.10.06)</div> <div>0.05 – 0.5 mL</div> <div>1160 PSI</div> <div>1/8 G</div> </div> <div> <div>1023208 (replaced 450.10.07)</div> <div>0.1 – 3.0 mL</div> <div>1160 PSI</div> <div>1/8 G</div> </div> <div> <div>415.12.21</div> <div>0.5 – 12 mL</div> <div>2175 PSI</div> <div>1/8 G</div> </div> PVA SB400-C	
2) Bead		
a) Machine Mounted	XYZ Mounting Dopag Dopag dispensers listed above shall supply material to the inlet of an additional 401.***.*** dispenser. Dual regulators are also required upstream of the dispenser. PVA SB400-C	
b) Robot Mounted	PVA RMP-SB400-C CONT-RMP-54 (controller) NOTE: IP54 rated controller only. NOTE: G-Series, 10-gauge x 3" needle is recommended Viscotec viproPUMP100 VisLas, viproPUMP_7 B-KC-Viscopro-C (controller, includes 5m cable)	
3) Gap Fill		
a) Single Component (1K)	PVA SB400-C	
b) Two Component (2K)	Scheugenpflug Process Module Dispensing (process unit) Pailfeed PF803 (fluid delivery) Pailfeed PFA803 (fluid delivery) (abrasive materials) P016 (dispensing head)	

7. Machine Electrical Controls Components

The "Machine Controls Electrical" column is organized by components. Nexteer Automotive does not have requirements for technologies not listed.

The "Global Common / Requirement" column has two functions:

- 1) Where components are designated, this is the Nexteer Automotive approved (required) component.
 - Where multiple brands 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 is 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 supplier's components may be used.

The "Examples" column lists example components that may be used providing they meet the specifications of the "Global Common / Requirement" column. These example components are readily available in our global regions. Example components are not listed in any preferred order.

NOTE: To identify regional preferences, the following notations is 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 supplier's components may be used.

NOTE: Where an approved supplier is followed by "(Special Applications)," these components may be used but require the Controls Engineer's prior approval.

NOTE: Changes since the last revision are highlighted

Machine Controls Electrical	Global Common / Requirement	Examples
A. Circuit Breakers		
1. Molder Case Circuit Breaker NOTE: Typically used for 480VAC / 380VAC	IEC 60947-2 CE CCC IP2X Minimum (C) C Trip Curve (or as noted by device manufacturer) D Trip Curve - Shall be used on primary side for transformers and power supplies 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 (or as noted by device manufacturer) D Trip Curve - Shall be used on primary side for transformers and power supplies 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 (C)
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 (or as noted by device manufacturer) D Trip Curve - Shall be used on primary side for transformers and power supplies 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 (C)
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-RCDA* A25 Schneider Electric Multi 9 - M9R11225 Acti 9 - A9R52225 (C)
B. Power Supplies		
1. Switched Mode DC a) 1-Phase Power Supplies	PULS (C) CP** .241 QS** .241	

Machine Controls Electrical	Global Common / Requirement	Examples
b) 3-Phase Supplies	<p>Allen-Bradley Bulletin 1606 1606-XLE***E* 1606-XLS***E*</p> <p>PULS (C) CT** .241 QT** .241</p> <p>Allen-Bradley Bulletin 1606 1606-XLE***E* 1606-XLS***E*</p>	
2. Uninterruptable Power Supply (UPS)	<p>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</p>	<p>TrippLite INTERNET350U (120VAC) TrippLite AVR550U (220VAC)</p> <p>APC SMART-UPS (C)</p>
C. Drives (Variable Frequency)	<p>Allen-Bradley PowerFlex 525 25B-D***N114 (380-480VAC 3ph, 0.5-30HP, internal line filtering)</p> <p>PowerFlex 527 25C-D***N114 (380-480VAC 3ph, 0.5-30HP, internal line filtering) NOTE: Requires use of motion processor</p> <p>PowerFlex 755 20G1*****ONNNNN (380-480VAC 3ph, 1.0-350HP) 20-750-S (Safe Torque Off Module) 20-HIM-A6 (Human Interface Module)</p>	
D. Motion Control 1. Servo Drives	<p>Allen-Bradley Kinetix 5500 2198-H0**-ERS (Three-phase input power supply only.) 2198-DB**-F (AC Line Filter)</p> <p>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)</p> <p>Kinetix 5700 2198-S***-ERS3 (Single Axis) 2198-D***-ERS3 (Dual Axis) 2198-DB**-F (AC Line Filter)</p> <p>IAI (Intelligent Actuator Inc.) PCON Series PCON-CGB-56P WAI-EP-0-0-DN</p> <p>RCON Series RCON-GWG-EP-FU* (Master Unit) RCON-***-* (Driver Unit)</p> <p>SCON Series SCON-CGB-*WAI-EP-0-2 RCM-101-USB (Software)</p>	
NOTE: IAI drives are only rated to 40° C		
2. Servo Motors	<p>Allen-Bradley VPL-A*****1*A* (0.46-13.38 Nm, 200V Class) VPL-B*****1*A* (0.46-33.0 Nm, 400V Class)</p> <p>MPL-A*****7*AA (0.26-26.8 Nm, 200V Class) MPL-B*****7*AA (0.26-163 Nm, 400V Class)</p> <p>MPM-A*****J7*AA (7.65-30.96 Nm, 200V Class) MPM-B*****J7*AA (2.18-62.8 Nm, 400V Class)</p> <p>VPC-B*****FS (17.6-191.1 Nm, 400V Class)</p>	
3. Electric Actuators	<p>Festo EGC-**-**-BS**-KF-0H-ML-GK (Linear Ballscrew) EGC-**-**-TB-KF-0H-GK (Linear Belt Drive)</p> <p>ELGA-BS-KF-**-****-0H-**-ML (Linear Ballscrew) ELGA-TB-KF-**-****-0H (Linear Belt Drive)</p> <p>ESBF-BS-**-**-** (Cylinder Ballscrew) EAGF-V2-KF-**-** (Cylinder Guide Unit)</p>	

Machine Controls Electrical	Global Common / Requirement	Examples
4. Multi-Axis System a) Two Axis	<p>EGSL-BS-**-**-** (Slide Ballscrew)</p> <p>ERMB-**-** (Rotary)</p> <p>NOTE: Festo axial and gear box mounting kits available for Kinetix servo motors</p> <p>NOTE: Festo sizing report required for approval on all applications.</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>	
	<p>IAI (Intelligent Actuator Inc.)</p> <p>IK - 2-Axis Kit</p> <p>X/Y Stroke – X=300mm Y=300mm</p> <p>IK2-SXBA21HHS-A-30-30-T2-5L-CT-CT-K</p> <p>XSEL-Q-2-150A-100A-EP-P1-EEE-2-2 Controller</p> <p>Single axis replacement actuator</p> <p>RCS2-SS8C-A-150-20-300-T2-R05</p> <p>RCS2-SS8R-A-100-20-300-T2-R05</p> <p>ISB - 2-Axis Kit</p> <p>X/Y Stroke – X=300mm Y=300mm</p> <p>ICSB2-BB1M-WA-30-30-T2-5L-CT</p> <p>XSEL-Q-2-100WAI-60WAI-EP-P1-EEE-2-2 Controller</p> <p>Single axis replacement actuator</p> <p>X: ISB-MXM-WA-100-10-300-T2-M-A3S-AQ</p> <p>Y: ISB-SXM-WA-60-8-300-T2-M-A2S-AQ</p> <p>Software for the XSEL controller</p> <p>IAI-101-XA-MW</p>	
	<p>IAI (Intelligent Actuator Inc.)</p> <p>IK - 3-Axis KitX/Y/Z Stroke – X=300mm Y=300mm, Z=100mm</p> <p>IK3-SBBG11HLS-A-30-30-10B-T2-5L-CT-CT-K</p> <p>XSEL-Q-3-100A-60A-30AB-EP-P1-EEE-2-2 Controller</p> <p>Single axis replacement actuator</p> <p>RCS2-SS8R-A-100-20-300-T2-R05-ML</p> <p>RCS2-SA7R-A-60-20-300-T2-R05-ML</p> <p>RCS2-SA6R-A-30-3-100-T2-R05-MR-B</p> <p>ISB - 3-Axis KitX/Y/Z Stroke – X=300mm Y=300mm Z=100mm</p> <p>ICSB3-BB1MB1L-WA-30-30-10B-T2-3L-CT-CT</p> <p>XSEL-Q-3-100WAI-60WAI-60WAI-B-EP-P1-EEE-2-2 Controller</p> <p>Single axis replacement actuator</p> <p>X: ISB-MXM-WA-100-10-300-T2-M-A3S-AQ</p> <p>Y: ISB-SXM-WA-60-8-300-T2-M-A1S-AQ</p> <p>Z: ISB-SXM-WA-60-4-100-T2-M-A3S-AQ-B</p> <p>Software for the XSEL controller</p> <p>IAI-101-XA-MW</p>	
E. Enclosure		
1. Enclosures, Operator Panels, Junction Boxes	Minimum of IP54 or NEMA12	Hoffman Rittal SCE
2. Enclosure Cooling a) Fan & Filter	<p>CE</p> <p>CCC (C)</p> <p>IP54</p> <p>Type 12 filter</p> <p>10-micron pleated element</p> <p>NOTE: Thermostats are encouraged</p>	Hoffman Pfannenberg Rittal
b) Air Conditioners	<p>CE</p> <p>CCC (C)</p> <p>IP54</p> <p>Condensate Evaporator</p>	Hoffman Pfannenberg Rittal IceCube
3. Power Distribution Blocks	<p>IEC 60947-7-1 or UL1953</p> <p>Screw Termination</p> <p>Copper and Aluminum Rated</p> <p>IP2X Minimum</p> <p>CE</p> <p>CCC (C)</p>	<p>Allen Bradley 1492-PD Series</p> <p>Eaton CHDB Series</p>

Machine Controls Electrical	Global Common / Requirement	Examples
4. Terminals		Phoenix PTU 35/4x6/6x2.5 (C) PTFIX 6/18x2,5-NS35 (C) Wohner 30Compact (C)
	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
F. Ethernet Switch 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 5700 1783-BMS06TGL (Lite Firmware, 6 RJ45 Ports) 1783-BMS10CGL (Lite Firmware, 10 RJ45 Ports) 1783-BMS10CGP (Full Firmware, CIP Sync Support, 10 RJ45 Ports) 1783-BMS20CGL (Lite Firmware, 18 RJ45 Ports) 1783-BMS20CGP (Full Firmware, CIP Sync Support, 18 RJ45 Ports)	
	Allen-Bradley Stratix 5200 1783-CMS6B (Base Firmware, 4 RJ45 Ports) 1783-CMS6P (Full Firmware, CIP Sync Support, 4 RJ45 Ports) 1783-CMS10B (Base Firmware, 10 RJ45 Ports) 1783-CMS10P (Full Firmware, CIP Sync Support, 10 RJ45 Ports) 1783-CMS20B (Base Firmware, 20 RJ45 Ports) 1783-CMS20P (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)	
	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)	
2. Lightly Managed		
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 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 Cat 5e or Cat 6 Patch Cables IP67 Type CMP, CMR, CMG, or CM (Tray Rated) High Flex (Applications with cable flexing or movement)	

Machine Controls Electrical	Global Common / Requirement	Examples
5. Ethernet Bulkhead Connectors	Minimum of IP54 (external to enclosure)	
G. Fuses 1. Disconnect	UL Class J	
H. Human Machine Interface Devices 1. Graphic Terminal	Allen-Bradley PanelView Plus 7 (Standard) 2711P-T6C2*D8S (5.7") 2711P-T7C2*D8S (6.5") 2711P-T10C2*D8S (10.4") PanelView Plus 7 (Performance) 2711P-T7C2*D9P (6.5") 2711P-T10C2*D9P (10.4")	
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)	
J. Laser Markers	NOTE: Refer to the Manufacturing Equipment Purchase Specification and / or the Purchasing Manufacturing Engineer.	
1. Plastic Surface Applications	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) 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	Laser Integration (enclosure) must comply with ANSI and OSHA safety standards.
2. Metal Surface Application	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)	

Machine Controls Electrical	Global Common / Requirement	Examples
3. Laser System Enclosure NOTE: Laser Safety Officer shall be contacted to review each laser enclosure.	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)	
	Class 1 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	Banner K50LGRYPQ (Tri Color) K30LGRYPQ (Tri Color) K80L4GRYB1PQ (Quad Color) M18GRYPQ WLS27*WGRYB5-****DS24Q WLS28-2*WGRYB5-****DS24Q
b) Stack Lights	24VDC IP65 CE	Allen-Bradley 855E Series Tower Lights 854J (40mm) & 854K (60mm) Banner TL50 Balluff BNI008*
2. Machine & Work Lighting	24VDC IP65 CE	Banner WLC60*W***AQ WLC90W*** Banner WLS28-2*W***DSQ WLS27-*W***DSQ WLS15*DW*****DSQP
3. Enclosure Lighting	24VDC IP2X CE	Banner WLS28-2*W***D*Q WLS27-*W***D*Q WLS15*DW*****D*QP
L. Motors (3-Phase)		
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	C-Face Mount NOTE: Requirements listed in the General Applications section above are also required.	Baldor Electric Company - CEM2333T US Motors (Nidec) – U15P2DC
c) High Slip Applications (Example: Presses, Heavy Conveyors)	NEMA Design D NOTE: Requirements listed in the General Applications section above are also required, except NEMA Design B.	
2. Variable Frequency Drive Controlled (VFD)	Inverter Rated NOTE: Requirements listed in the General Applications section above are also required.	Baldor Electric Company - EM2333T

Machine Controls Electrical	Global Common / Requirement	Examples
M. Plug/Socket Combination 1. When interlocking is not required per SD-004. 2. When interlocking is required per SD-004. (such as 30A or greater)	First Make / Last Break PE (earthing) contact Retaining Means IP54 CE CCC (C)	Harting Hubbell Twist-Lock
	First Make / Last Break PE (earthing) contact Retaining Means IP54 CE CCC (C) Interlocking Switching Device (Disconnect only when OFF) NOTE: A switch-rated, or disconnect-rated, plug /socket combination meets this interlocking switching device requirement.	Meltric Corporation Hubbell Circuit-Lock
N. Programmable Logic Controllers & Modules 1. Controllers 2. Power Supplies 3. Communication Modules 4. I/O Modules a) Chassis Based b) In-Cabinet Distributed (IP20) c) On-Machine Distributed (IP65/67) 1) Ethernet/IP 2) Network Interface 3) IO-Link 5. Communication Gateways	Allen-Bradley 5069 CompactLogix 5380 5069-L3**ER 5069-L3**ERM (CIP Motion) NOTE: GuardLogix Controllers are NOT allowed. 1756 ControlLogix 5580 1756-L8*E	
	Allen-Bradley 1756 ControlLogix 1756-PB72 (10A) Chassis Series A or B 1756-PB75 (13A) Chassis Series B	
	Allen-Bradley 1756 ControlLogix 1756-EN4TR (Dual Port EtherNet/IP, 1-256 Motion Axis)	
	Allen Bradley 5069 Compact 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. NOTE: Safety I/O Modules are NOT allowed.	
	Allen-Bradley 1734 Point I/O 5069 Compact I/O NOTE: Safety I/O Modules are NOT allowed.	
	Balluff BNI004F - BNI EIP-302-105-Z015 (16pt, Dual EtherNet/IP Ports) Balluff BNI006A - BNI EIP-508-105-Z015 (8 port, 8 IO-Link, with display) BNI009T - BNI EIP-507-005-Z040 (4 port, 4 IO-Link, No display) BNI00HM - BNI EIP-508-005-Z015 (8 port, 8 IO-Link, No display)	
	Balluff BNI00JO - BNI IOL-104-000-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. NOTE: Modules require Balluff IO-Link Network Interface.	
	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) P-R2-M3REF0-U626 (E) P-R2-M3RAFO-U626 (C) P-R2-K3RW0-U626 (B) P-R2-M3RUVO-U626 (Universal)

Machine Controls Electrical	Global Common / Requirement	Examples
		Mencom GF-RJ45-R-32 (NA) EP-RJ45-R-32 (E) DCH2-RJ45-R-32 (C) DBR-RJ45-R-32 (B) DUN-RJ45-R-48 (Universal) Weidmueller 1450530000 (C) 1450550000 (C) 1962840000 (C) 1487920000 (C) 1450790000 (C)
P. Pushbuttons, Pilot Lights, and Selector Switches 1. General Pushbuttons, Pilot Lights, and Selector Switches	IEC 22.5mm IP62 CE	Allen-Bradley 800F (P or M) 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 (Cycle Initiation)	IEC 60947-5-1 24Vdc CE PNP or Bipolar	Banner Opto-Touch OTBV*** Banner EZ Light Touch K50APTGRCO E-Z Banner STB Series STBV*** NOTE: For safety applications such as: Two-Hand Control
Q. Operator ID Systems 1. Badge Reader a) Magnetic Strip b) Proximity/RFID NOTE: Verify card type based on plant region.	NOTE: Refer to the Manufacturing Equipment Purchase Specification and/or contact the purchasing engineer. RFIDeas - pcSwipe Enroll MS-300M1AK5 BKT-BASE (Base Kit) RFIDeas - pcProx Plus KT-800W1AKB-P-IP67	NOTE: Only available in RS-232 ASCII communications. 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

Machine Controls Electrical	Global Common / Requirement	Examples
		Phoenix Contact (C) PLC-R (2966171) PLC-O (2966634)
T. RFID Systems - Pallet/Part Tracking		
1. Network Interface	Balluff - IO Link Master NOTE: Refer to section 7.N.4.c.2 for complete requirements.	
2. 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.	
3. 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.	
U. Safety Interlock Switches		
1. Non-Contact Type	Allen Bradley 440N-Z1S**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)	Euchner STP3A-2131A024L024M-091748 (switch) STP3A-2131A024MC1993-102267 (switch, escape release option) BETAETIGER-S-***-N-0957** (actuator) FE-GRIF-105329 (escape release) Keyence GS-51PC (switch) GS-A21 (actuator) GS-H02 (escape release) Telemecanique XCSLF373731* (switch) XCSLF373741* (switch) (escape release) XCSZ0* (actuator)	
NOTE: Escape Release shall be provided for a Power-ON to Release guard locking switch where full body access is possible.		
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)	

Machine Controls Electrical	Global Common / Requirement	Examples
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	
V. Safety Presence Sensing Device		
1. Safety Light Curtain	14mm Resolution 24VDC IP65 CE IEC 61496-1 compliance to Type 4 ESPE ISO 13849 PL e	Banner EZ Screen LP EZ Screen LS SICK C4000 Series De Tec 4 Series Keyence GL-R Series
2. Safety Laser Scanners (Area Scanner)	30mm Resolution 24VDC IP65 CE IEC 61496-1 compliance to Type 3 ESPE ISO 13849 PL d Class 1 laser classification	SICK S300 Mini 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)	
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	
3. Two-Hand Control	Allen-Bradley 440R-D23171 Pilz PNOZ s6 #750106	
4. Zero Speed Indicator	Pilz PSWZ X1P #777949	

Machine Controls Electrical	Global Common / Requirement	Examples
5. Safety Timer Relay	ABB Sentry TSR10 NOTE: Used on full body access cells with blind spots, requiring a Pre-Reset feature.	
Y. Motor Starters/Contactors 1. Contactors/Overloads	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.	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)
2. Motor Starter/Protector (MSP)	IEC 60947-4-1 IP2X Minimum DIN rail mounting CE CCC (C)	Allen-Bradley 140MT Series Schneider GV2P Series
Z. Support Software Requirements 1. Programmable Logic Controllers (PLC)	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 34 or newer	
2. Human Machine Interface (HMI)	Rockwell Software FactoryTalk View Studio ME 9701-VWSTNMRT1* Version 12 or newer	
AA. Disconnect Switches 1. Flange Mounted Disconnect	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	Allen-Bradley 1494U Series (C) 1494V Series Square D 9422 Series
2. Rotary Side Mount Disconnect NOTE: Through the door rotary disconnects shall not be used.	Lockable in OFF position only IEC 60947-1 - General rules IEC 60947-3 – Switches, disconnects, switch CE CCC (C) IP2X Minimum	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.
3. Single Phase Supply NOTE: Special Applications only.	lockable in OFF position only IEC 60947-1 - General rules IEC 60947-3 – Switches, disconnects, switch CE CCC (C) IP2X Minimum	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 NOTE: Rotary disconnect used with Bussman Compact Circuit Protector (CCP) below.
4. Supplementary Disconnect (Load Switch) NOTE: Local motor isolation, disconnect switch and robot disable applications.	Lockable in OFF position only. IEC 60947-1 - General rules IEC 60947-3 – Switches, disconnects, switch CE CCC (C) IP2X Minimum	Allen-Bradley 194E-E** 194E-FA**E (with enclosure) 194E-E16-1753-4G (robot disable) Schneider V01 (switch disconnecter) V01C (switch disconnecter) VBFXGE1 (black handle, enclosure)

Machine Controls Electrical	Global Common / Requirement	Examples
BB. Switches and Sensors 1. Float Level	IFM Efector LK8 (Oil, water and coolant applications) LT80** (Oil, water and coolant applications) KI5085 (Plastics or non-ferrous materials) ACT (Advanced Control Technologies) B40033AFD2M558 NOTE: For hydraulic tank level and temperature applications: Level = NOHC Temp = NC – Opens at 130F E11627 Tee Splitter (M12 8-Pin to two M12 4-Pin) NOTE: Sensor connection shall be M8 or M12. Special connectors require Controls Engineer prior approval.	
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 - ADN, ADNGF, DSBC, DGC, DFM, HGD 32 & 50, HPV, DSNU-12-*, DSNU-25 SMC - C96N	Festo SMT-8M-A-PS-24V-E-0,3-M8D, 574334 (Threaded) SMT-8G-PS-24V-E-0,3M-PSG-3S, 547860 (90 degree or short) IFM Efector MK5101 (Snap/Threaded) Turck BIM-UNT-AP6X-0.3M-PSG-3S (Snap/Threaded)	 PIN 1 = + PIN 3 = - PIN 4 = OUT
b) C-Slot Festo - HGPT, HGPD, HGPL SMC - CD55, CDQM, MHZ2	Festo SMT-10M-PS-24V-E-0,3-L-M8D, 551375 (Threaded) SMT-10G-PS-24V-E-0,3Q-M8D, 547863 (90 degree or short) IFM Efector MK5310 (Snap/Threaded) Turck BIM-UNR-AP6X-0.3M-PSG-3S W/M (Snap/Threaded) SMC D-M9PSAPC	 PIN 1 = + PIN 3 = - PIN 4 = OUT
c) Brackets Festo - DSNU-12-* SMC - CD85	Festo SMBR-8-12, 175093 IFM Efector E11816 Turck KLR-1 W/ASB-2	

Machine Controls Electrical	Global Common / Requirement	Examples
Festo - DSNU-25 SMC - CD85	Festo SMBR-8-25, 175096 IFM Efector E11818 Turck KLR-1 W/ASB-3	
SMC - CD55, CDQM SMC - C96N	SMC D-M9PSAPC	
5. Limit a) General Applications	IFM E11797	
	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)
b) Wobble / Whisker Stick (Cycle Initiation) NOTE: Not to be used for equipment going to China or Poland.	Honeywell LSJ1A-7N Telemecanique XCK-J	
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)	
7. Proximity (Metallic)	IFM Efector Dry applications – Long distance IM5115, 40mm size, M12, 20mm range (Special Applications) Im5117, 40mm size, M12, 40mm range (Special Applications) IFM Efector Wet or dry applications 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 (Special Applications) IIT231, 30mm size, M12, non-flush, 25mm range (Special Applications) IFM Efector Welding and Hardening Applications Weld slag resistant and magnetic-filed immune IER200, 8mm size, M12, flush, 2mm range IEW200, 8mm size, M8, flush, 3mm range (Special Applications) IFR207, 12mm size, M12, flush, 4mm range IGR207, 18mm size, M12, flush, 8mm range IIR207, 30mm size, M12, flush, 15mm range (Special Applications)	
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

Machine Controls Electrical	Global Common / Requirement	Examples
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)
DD. Vision Applications	Feasibility study REQUIRED for all applications. Exception, vision guided robots.	
1. Vision Sensor (Basic Applications)	Cognex In-Sight 2000 Series Keyence IV Series IX Series	
2. Vision Systems (Complex Application)	Cognex In-Sight 7000, 8000, 9000 Series In-Sight D900 Keyence IV Series CV-X Series XGX Series XG-8000 Series	
3. Visualization Display / Software NOTE: Standard PC, monitor, and software. Installed at readily accessible location.	Cognex – Vision View VVPC-SL (Software for use on PC) Keyence IV3-CP50 (Intelligent Monitor) IV3-Navigator (Software)	

8. Manufacturing Information Technology System Components

The "MIT System Component" column is organized by components. Nexteer Automotive does not have requirements for technologies not listed.

The "Global Common / Requirement" column has two functions:

- 1) Where components are designated, this is the Nexteer Automotive approved (required) component.
 - Where multiple brands 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 is 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 supplier's components may be used.

The "Examples" column lists example components that may be used providing they meet the specifications of the "Global Common / Requirement" column. These example components are readily available in our global regions. Example components are not listed in any preferred order.

NOTE: To identify regional preferences, the following notations is 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 supplier's components may be used.

NOTE: Where an approved supplier is followed by "(Special Applications)," these components may be used but require the Controls Engineer's prior approval.

NOTE: Changes since the last revision are highlighted

MIT Systems Component	Global Common / Requirement	Examples
A. Computer Hardware 1. Standard PC (Traceability / Monitoring / LabView Test Equipment)	Machine Requirements: Windows 11 Vendor software & PC must be compatible with ESET antivirus software. NOTE: Wifi devices NOT allowed Hardware below is recommended as a minimum: Intel i5 9th Gen Processor 16GB RAM Memory 512 GB SSD 1 Ethernet Port	Dell Precision Advantech
2. Uninterruptable Power Supply (battery backup)	Requires USB conection to PC with configuration to command PC to shut down if power outage exceeds one minute.	TrippLite INTERNET350U (120VAC) TrippLite AVRX550U (220VAC)