



aerospace
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Electronic Control Systems Controllers and Accessories

Catalog HY33-5000/US
North American Product Offering



ENGINEERING YOUR SUCCESS.

**WARNING - USER RESPONSIBILITY**

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

- This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.
- The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.
- To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

OFFER OF SALE

The items described in this document are hereby offered for sale by Parker-Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated in the detailed "Offer of Sale" elsewhere in this document or available at www.parker.com.

SAFETY

For safety information, see Safety Guide at www.parker.com/safety or call 1-800-CParker.

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VMM (Vansco Multiplexing Modules)

The VMM modules are general purpose controllers for vehicle and other applications. All VMM modules are 100% compatible with other Parker Vansco multiplexing modules.

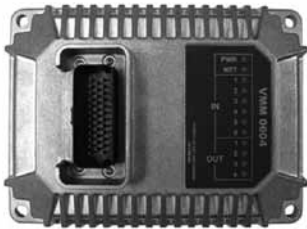
VMM modules communicate with other VMM modules, or may

communicate with an IQAN master, over a CAN bus using J1939 protocol.

The VMM modules are auto-programming when placed in a compatible existing system, and have status LEDs that indicate the condition of inputs, outputs, power,

and network activity.

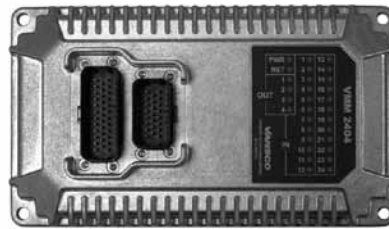
The VMM modules monitor their outputs continuously for fault information. Detected faults include short circuits (to ground or power), over currents and open load. In the event of a fault, the units will disable the output(s) that are faulted.



VMM0604

The VMM0604 has 6 general purpose inputs capable of being configured for active high or active low signals. Additionally they may be used for reading analog voltages, or as 6 frequency inputs (2 AC coupled and 4 DC coupled). The VMM0604 has 4 high-side outputs with a max current of 2.5A and max PWM frequency of 500 Hz. There are 4 low-side outputs capable of current sensing. Outputs can drive any type of vehicle load including relays, solenoids, fans, etc.

Description	Ordering PN
VMM0604	0836001ECD

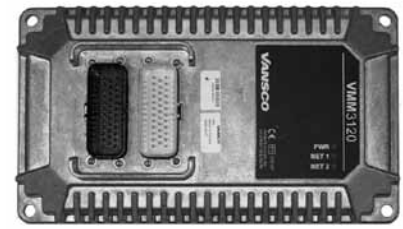


VMM2404

The VMM2404 has 15 general purpose inputs capable of being configured for active high or active low signals. Additionally they may be used for reading analog voltages, or as 6 frequency inputs (2 AC coupled and 13 DC coupled). The unit also has 9 dedicated digital inputs.

The VMM2404 has 4 high-side outputs with a max current of 2.5A and max PWM frequency of 500 Hz. There are 4 low-side outputs capable of current sensing. Outputs can drive any type of vehicle load including relays, solenoids, fans, etc.

Description	Ordering PN
VMM2404	0837002ECD

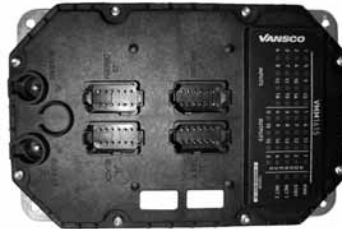


VMM3120

The VMM3120 has 17 digital inputs. The digital inputs are used for reading active high signals. Two of the inputs may be used for power control. In addition, it has 10 inputs capable of reading analog voltages, and 4 frequency inputs (2 AC coupled and 2 DC coupled). The VMM3120 has 16 high-side outputs with a max current of 2.5A and max PWM frequency of 500 Hz. There are 4 low-side outputs capable of current sensing. Outputs can drive any type of vehicle load including relays, solenoids, fans, etc.

Description	Ordering PN
VMM3120	0916014ECD

VMM (Vansco Multiplexing Modules)



Custom Controllers

VMM1210

The VMM1210 has 8 programmable digital inputs, all of which are capable of doing power control, and reading active high, or active low inputs. In addition, it has 4 inputs capable of reading analog voltages, frequency values or digital active low inputs.

The VMM1210 has 8 high current (10 A max) high-side outputs. It also has two low current (3 A max) outputs capable of driving either high-side or low-side loads, and that can also be arranged in an H-Bridge configuration. Outputs can drive any type of vehicle load including lights, relays, solenoids, fans, etc.

Description	Ordering PN
VMM1210	0736007ECD

VMM1615

The VMM1615 has Wake on CAN. It has 7 digital inputs; 5 of the inputs are used for reading active high/low signals, 1 input is used for reading active high signals, and 1 input is used for active high power control. In addition, it has 8 inputs capable of reading analog voltages, and 1 DC coupled frequency input.

The VMM1615 has 12 high-side outputs with a max PWM frequency of 500 Hz. 6 are high current (10 A max) outputs, 4 of the high-side outputs are capable of accurate current sensing. It also has 1 low-side output that is capable of current sensing with a max PWM frequency of 1500 Hz, and 2 solid state relay outputs. These outputs can drive a variety of load types.

Description	Ordering PN
VMM1615	0935021ECD

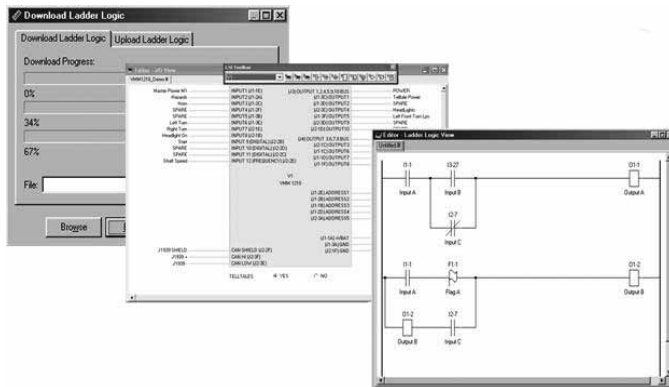
The VMM modules are able to have different I/O configurations created by customizing the components used on the circuit board in the hardware.

CM (Controller Module) versions of the VMM modules are available for custom programming using C language, instead of the VMMS ladder logic software.

All custom variations of hardware are offered based on large volume customers and may be subject to development and engineering service fees to provide a tailored controller solution for your project.

Contact your Parker representative if you have a large scale opportunity that requires custom control electronics.

VMMS ladder logic software



VMMS

VMMS is a ladder-logic based programming tool that allows users to define the logic for their VMM system as well as perform real-time diagnostics.

Contents

When ordering VMMS, the following items are included:

- 1 licence

The installation files are available from our website, along with the registration and request forms needed to obtain a licence, which will be keyed to your specific customer ID.

The user's manual for VMMS is provided in electronic format and may be downloaded from our website www.parker.com/ecd.

Communication cables are not included. Order the cables you need from the accessories section.

VMMS ladder logic software is available in 3 versions.

Creative

Creative level provides full access to create and edit ladder logic applications.

Description Ordering PN

Creative level ECD736618ECD

Productive

Productive level has advanced diagnostics, log access, I/O forcing, viewing, printing, and upload/download capabilities.

Description Ordering PN

Productive level ECD736617ECD

Active

Active level has basic diagnostics, viewing, and upload/download capabilities.

Description Ordering PN

Active level ECD736616ECD

VT (Virtual Terminal)



ISOBUS VT

The ISOBUS-VT is an entry-level ISO standard virtual terminal for use with a wide range of agricultural machinery.

The ISOBUS-VT is the primary man/machine interface for any ISO 11783 compatible system, enabling an operator to control auxiliary equipment from a central unit via a suitable network interconnection unit, regardless of manufacturer. ISOBUS-VT offers optimized software based on the ISOBUS standard.

The ISOBUS-VT is intended for in-vehicle use only. The ISOBUS-VT has a 5.7" anti-glare TFT color display, giving wide viewing angle. The unit has also internal buzzer and real time clock. Equipment selection, setup and monitoring is made quick and simple by means of a sequence of front mounted and backlit soft keys, a multipurpose rotary encoder, working set selection and arrow function keys.

The unit is designed to be easily mounted in a vehicle cabin with VESA 75 mounting method, and optionally with RAM mounting system. The unit has one sealed AMP Superseal 26 position connector.

Description	Ordering PN
ISOBUS VT	65LCCT02

Custom Displays

Vansco displays can be designed and built to fit specific customer applications. A variety of LCD and TFT color display types and button layouts can be combined in custom, machine specific shapes for installation in armrests or dashes.

All custom variations of hardware are offered based on large volume customers and may be subject to development and engineering service fees to provide a tailored display solution for your project.

Contact your Parker representative if you have a large scale opportunity that requires a custom display.

Custom Clusters and Panels

Instrument clusters and display panels for vehicle interface are highly customizable. A variety of gauges and display types can be combined in custom, machine specific shapes for installation in panels or pillars.

All custom variations of hardware are offered based on large volume customers and may be subject to development and engineering service fees to provide a tailored instrument solution for your project.

Contact your Parker representative if you have a large scale opportunity that requires custom instrument cluster or display panel electronics.

DPS (Display Panel Standard)

The DPS instrument cluster is an innovative user interface that makes complete vehicle information accessible in a single centralized location. By incorporating the new cluster, a wide range of industrial

vehicles can be operated more efficiently for greater productivity.

The robust enclosure is designed to be used in rugged environments, and has been tested to a suitable mix of standards based on the J1455,

ISO, and EP455 environmental specifications.

The DPS units are programmed in C and require advanced programming skills. The VMMS software is not used with the DPS family.



DPS, 3 to 5 gauge

The versatile DPS instrument cluster supports two CAN communication channels, as well as USB. The DPS has 20 digital inputs: 4 active high w/wake-up, 6 active high, and 10 active low. There are 5 analog inputs (3 voltage, and 2 resistive), and 2 frequency inputs. For outputs the DPS has 1 high-side and 1 low-side. The outputs provide a max current of 2.0 A with pulse width modulation capabilities, and analog feedback provides open circuit, short to battery, and ground detection.

The DPS cluster has up to five backlit gauges, as many as 26 positions for LED indicators (tell-tales) and a 256x80 pixel transfective FSTN LCD screen.

The connectors are rugged, environmentally sealed, Molex MX150 type.

Description	Ordering PN
DPS-5	contact factory
DPS-4	contact factory
DPS-3	contact factory



DPS-C

The DPS-C is designed for the construction market and has a standard electronic configuration and standard overlay. The end user can customize the DPS-C with a custom overlay and custom application software.

The DPS-C supports two CAN communication channels, as well as USB. The DPS-C has 18 digital inputs: 4 are active high with wake-up. There are 4 analog inputs, and 2 frequency inputs (fixed voltage threshold open collector). For outputs the DPS-C has 2 high-side and 2 low-side. The outputs provide a max current of 2.5 A with pulse width modulation capabilities, and analog feedback provides open circuit, short to battery, and ground detection.

The DPS-C cluster has five backlit gauges, 28 positions for LED indicators (tell-tales) and a 3.5", transfective color LCD, 320 x 240 pixel screen.

The connectors are rugged, environmentally sealed, Molex MX150 type.

Description	Ordering PN
DPS-C	contact factory

Sensors



TGSS

The True Ground Speed Sensor (TGSS) determines ground speed using Doppler beam technology, and reports the information using a frequency signal. The TGSS is intended for applications with a steady voltage of less than or equal to 16 Vdc. The sensor can be specified with one of 2 microwave carrier frequencies, either the standard frequency, or one suitable for the United Kingdom. The sensors have a short cable with option for an attached AMP Superseal or Deutsch DT series connector.

Description	Ordering PN
TGSS-A	0740059ECD
TGSS-A-UK	0740078ECD
TGSS-D	0740051ECD
TGSS-D-UK	0740072ECD



PGM

The Pocket Gateway Module (PGM) is a general purpose communication protocol converter and filter for vehicle applications. It has four communication ports:

- two CAN/J1939 ports
- one J1708/J1587 port
- one RS232 diagnostics and programming port.

Description	Ordering PN
PGM	0699001ECD

Accessories



USB-DLA

The Data Link Adapter (DLA) provides the link between a PC and the controller network. Information from the engine and transmission is converted and transferred from vehicle ports (J1939, J1708) to computer port (USB). The USB-DLA kit is supplied in a high density polyethylene, blow-molded case. The kit includes cables to interface with either J1939, or J1587/1708 diagnostic ports. There are also cables for Deutsch or Cannon connector types used in vehicle communication buses, 2 “Y” adapters, a CAN bus terminator, and a USB cable to connect the DLA to your laptop computer.

Description	Ordering PN
USB-DLA kit	0779A06ECD



Controller I/O board

The Controller I/O Board (CIOB) is a general-purpose simulation board that is used to test logic. The CIOB has various connectors that connect to inputs, outputs, power, and CAN. It has 20 bulbs and 6 LEDs that (through application software) can indicate if your application simulations are working.

Description	Ordering PN
CIOB kit	0913003ECD

Cables and Overlays

Parker has development cables for all VMM modules, cables to support connection of modules to the Controller I/O Board, and module specific overlays that can be used on the CIOB to identify channels.

Development cables

Description	Ordering PN
VMM0604 cable	0836701ECD
VMM2404 cable	0837701ECD
VMM3120 cable	0885707ECD
VMM1210 cable	0736003ECD
VMM1615 cable	0913708ECD

Connectors

Description	Ordering PN
VMM0604, VMM2404, VMM3120 kit	0916022ECD
VMM1210 kit	0736004ECD
VMM1615 kit	0935023ECD

Controller I/O cables

Description	Ordering PN
VMM0604 IO hrns	0913704ECD
VMM2404 IO hrns	0913705ECD
VMM3120 IO hrns	0913703ECD
VMM1210 IO hrns	0913700ECD
VMM1615 IO hrns	0913709ECD

Controller I/O overlays

Description	Ordering PN
VMM0604 overlay	0913505ECD
VMM2404 overlay	0913506ECD
VMM3120 overlay	0913504ECD
VMM1210 overlay	0913501ECD
VMM1615 overlay	0913509ECD

Offer of Sale

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods, services or work described will be referred to as "Products".

1. Terms and Conditions. Seller's willingness to offer Products, or accept an order for Products, to or from Buyer is subject to these Terms and Conditions or any newer version of the terms and conditions found on-line at www.parker.com/saleterms/. Seller objects to any contrary or additional terms or conditions of Buyer's order or any other document issued by Buyer.

2. Price Adjustments; Payments. Prices stated on Seller's quote or other documentation offered by Seller are valid for 30 days, and do not include any sales, use, or other taxes unless specifically stated. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). Payment is subject to credit approval and is due 30 days from the date of invoice or such other term as required by Seller's Credit Department, after which Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.

3. Delivery Dates; Title and Risk; Shipment. All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon placement of the products with the shipment carrier at Seller's facility. Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyer's request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.

4. Warranty. Seller warrants that the Products sold hereunder shall be free from defects in material or workmanship for a period of twelve months from the date of delivery to Buyer or 2,000 hours of normal use, whichever occurs first. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, MERCHANTABILITY AND FITNESS FOR A PARTICULAR USE.**

5. Claims; Commencement of Actions. Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 30 days after delivery. Buyer shall notify Seller of any alleged breach of warranty within 30 days after the date the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for an amount due on any invoice) must be commenced within 12 months from the date of the breach without regard to the date breach is discovered.

6. LIMITATION OF LIABILITY. UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. **IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.**

7. User Responsibility. The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

8. Loss to Buyer's Property. Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, will be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer ordering the items manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Special Tooling. A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

10. Buyer's Obligation; Rights of Seller. To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

11. Improper use and Indemnity. Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other

claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

12. Cancellations and Changes. Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

13. Limitation on Assignment. Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

14. Force Majeure. Seller does not assume the risk and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

15. Waiver and Severability. Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

16. Termination. Seller may terminate this agreement for any reason and at any time by giving Buyer thirty (30) days written notice of termination. Seller may immediately terminate this agreement, in writing, if Buyer: (a) commits a breach of any provision of this agreement (b) appoints a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or by a third party (d) makes an assignment for the benefit of creditors, or (e) dissolves or liquidates all or a majority of its assets.

17. Governing Law. This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement.

18. Indemnity for Infringement of Intellectual Property Rights. Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If a Product is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Product so as to make it non-infringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

19. Entire Agreement. This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

20. Compliance with Law, U. K. Bribery Act and U.S. Foreign Corrupt Practices Act. Buyer agrees to comply with all applicable laws and regulations, including both those of the United Kingdom and the United States of America, and of the country or countries of the Territory in which Buyer may operate, including without limitation the U. K. Bribery Act, the U.S. Foreign Corrupt Practices Act ("FCPA") and the U.S. Anti-Kickback Act (the "Anti-Kickback Act"), and agrees to indemnify and hold harmless Seller from the consequences of any violation of such provisions by Buyer, its employees or agents. Buyer acknowledges that they are familiar with the provisions of the U. K. Bribery Act, the FCPA and the Anti-Kickback Act, and certifies that Buyer will adhere to the requirements thereof. In particular, Buyer represents and agrees that Buyer shall not make any payment or give anything of value, directly or indirectly to any governmental official, any foreign political party or official thereof, any candidate for foreign political office, or any commercial entity or person, for the purpose of influencing such person to purchase products or otherwise benefit the business of Seller.

02/12

Parker's Motion & Control Technologies

At Parker, we're guided by a relentless drive to help our customers become more productive and achieve higher levels of profitability by engineering the best systems for their requirements. It means looking at customer applications from many angles to find new ways to create value. Whatever the motion and control technology need, Parker has the experience, breadth of product and global reach to consistently deliver. No company knows more about motion and control technology than Parker. For further info call 1 800 272 7537



AEROSPACE

Key Markets

- Aircraft engines
- Business & general aviation
- Commercial transports
- Land-based weapons systems
- Military aircraft
- Missiles & launch vehicles
- Regional transports
- Unmanned aerial vehicles

Key Products

- Flight control systems & components
- Fluid conveyance systems
- Fluid metering delivery & atomization devices
- Fuel systems & components
- Hydraulic systems & components
- Inert nitrogen generating systems
- Pneumatic systems & components
- Wheels & brakes



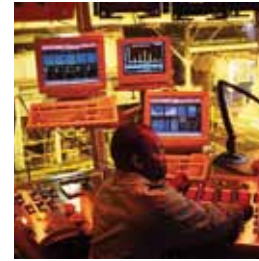
CLIMATE CONTROL

Key Markets

- Agriculture
- Air conditioning
- Food, beverage & dairy
- Life sciences & medical
- Precision cooling
- Processing
- Transportation

Key Products

- CO² controls
- Electronic controllers
- Filter driers
- Hand shut-off valves
- Hose & fittings
- Pressure regulating valves
- Refrigerant distributors
- Safety relief valves
- Solenoid valves
- Thermostatic expansion valves



ELECTROMECHANICAL

Key Markets

- Aerospace
- Factory automation
- Life science & medical
- Machine tools
- Packaging machinery
- Paper machinery
- Plastics machinery & converting
- Primary metals
- Semiconductor & electronics
- Textile
- Wire & cable

Key Products

- AC/DC drives & systems
- Electric actuators, gantry robots & slides
- Electrohydrostatic actuation systems
- Electromechanical actuation systems
- Human machine interface
- Linear motors
- Stepper motors, servo motors, drives & controls
- Structural extrusions



FILTRATION

Key Markets

- Food & beverage
- Industrial machinery
- Life sciences
- Marine
- Mobile equipment
- Oil & gas
- Power generation
- Process
- Transportation

Key Products

- Analytical gas generators
- Compressed air & gas filters
- Condition monitoring
- Engine air, fuel & oil filtration & systems
- Hydraulic, lubrication & coolant filters
- Process, chemical, water & microfiltration filters
- Nitrogen, hydrogen & zero air generators



FLUID & GAS HANDLING

Key Markets

- Aerospace
- Agriculture
- Bulk chemical handling
- Construction machinery
- Food & beverage
- Fuel & gas delivery
- Industrial machinery
- Mobile
- Oil & gas
- Transportation
- Welding

Key Products

- Brass fittings & valves
- Diagnostic equipment
- Fluid conveyance systems
- Industrial hose
- PTFE & PFA hose, tubing & plastic fittings
- Rubber & thermoplastic hose & couplings
- Tube fittings & adapters
- Quick disconnects



HYDRAULICS

Key Markets

- Aerospace
- Aerial lift
- Agriculture
- Construction machinery
- Forestry
- Industrial machinery
- Mining
- Oil & gas
- Power generation & energy
- Truck hydraulics

Key Products

- Diagnostic equipment
- Hydraulic cylinders & accumulators
- Hydraulic motors & pumps
- Hydraulic systems
- Hydraulic valves & controls
- Power take-offs
- Rubber & thermoplastic hose & couplings
- Tube fittings & adapters
- Quick disconnects



PNEUMATICS

Key Markets

- Aerospace
- Conveyor & material handling
- Factory automation
- Life science & medical
- Machine tools
- Packaging machinery
- Transportation & automotive

Key Products

- Air preparation
- Brass fittings & valves
- Manifolds
- Pneumatic accessories
- Pneumatic actuators & grippers
- Pneumatic valves & controls
- Quick disconnects
- Rotary actuators
- Rubber & thermoplastic hose & couplings
- Structural extrusions
- Thermoplastic tubing & fittings
- Vacuum generators, cups & sensors



PROCESS CONTROL

Key Markets

- Chemical & refining
- Food, beverage & dairy
- Medical & dental
- Microelectronics
- Oil & gas
- Power generation

Key Products

- Analytical sample conditioning products & systems
- Fluoropolymer chemical delivery fittings, valves & pumps
- High purity gas delivery fittings, valves & regulators
- Instrumentation fittings, valves & regulators
- Medium pressure fittings & valves
- Process control manifolds



SEALING & SHIELDING

Key Markets

- Aerospace
- Chemical processing
- Consumer
- Energy, oil & gas
- Fluid power
- General industrial
- Information technology
- Life sciences
- Military
- Semiconductor
- Telecommunications
- Transportation

Key Products

- Dynamic seals
- Elastomeric o-rings
- EMI shielding
- Extruded & precision-cut, fabricated elastomeric seals
- Homogeneous & inserted elastomeric shapes
- High temperature metal seals
- Metal & plastic retained composite seals
- Thermal management

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