Ref: YM50003 (09/06)
IMPORTANT SAFETY WARNING

Please read these instructions carefully BEFORE this instrument is installed or maintained.

To conform with the Health and Safety at Work Act 1974 our product should be installed, used and maintained in accordance with:-

1. Normal safety procedures.
2. The installation and operating instructions provided for each instrument.
3. BS6739 for general applications.
4. BSEN 60079 for hazardous area applications.

If for any reason local conditions dictate non-compliance with the above, we should be consulted.

These converters are intended for use in industrial compressed air systems only. Ensure that adequate pressure relief provision is installed if application of system supply pressure could cause downstream equipment to malfunction. Installation should be in accordance with local and national compressed air and instrumentation codes.

Products certified for use in explosion proof (flameproof) or intrinsically safe installation MUST

a) Be installed in accordance with local and national codes for hazardous area installations
b) Only be used in situations which comply with the certification conditions stated in this handbook.
c) Only be maintained by qualified personnel with adequate training on hazardous area instrumentation.

Before using these products with fluids other than air, for non-industrial applications, or for life-support systems consult Norgren.

LIMITED WARRANTY, DISCLAIMER & LIMITATION OF REMEDIES

Items sold by Norgren are warranted to be free from defects in materials and workmanship for a period of two years from the date of manufacture, provided said items are used according to Norgren’s recommended usages. Norgren’s liability is limited to the repair of, refund of purchase price paid for, or replacement in kind of, at Norgren’s sole option, any items proved defective, provided the allegedly defective items are returned to Norgren prepaid. The warranties expressed above are in lieu of and exclusive of all other warranties.

There are no other warranties, expressed or implied, except as stated herein. There are no implied warranties of merchantability or fitness for a particular purpose, which are specifically disclaimed. NORGREN’S liability for breach of warranty as herein stated is the exclusive remedy, and in no event shall NORGREN be liable or responsible for incidental or consequential damages, even if the possibility of such incidental or consequential damages has been made known to NORGREN.

Norgren reserve the right to discontinue manufacture of any product or change product materials, design, or specifications without notice.

Our policy is one of continuous research and development. We therefore reserve the right to amend without notice the specifications given in this document. Customers are responsible for ensuring that the product is used only for the purpose of which it is intended. In case of doubt Norgren will be pleased to advise.
If you need more information, please read the complete handbook.

1. Connect an air supply (11 bar max) to the VP51 filtered to 5 µm; use thread sealant. (e.g. red loctite 542)
   - Use Oil-Free Air
   - Do Not use PTFE Tape

2. Connect a suitable signal source (0-10V, 4-20mA) to range to pin 3 (blue) +ve and pin 4 (black) common –ve.

3. Connect a 24V dc power supply across Pin 1 (red) and Pin 4 (black)
   - Check the Connections and Polarity

4. Connect a suitable load or gauge to the outlet port

5. Switch on supply and the proportional valve should operate

6. Set-up can be made off-line (pressure) for desired outlet pressure, feedback signal and range settings. Fine-tuning can be performed using online set-up.

7. Adjust the Proportional and Integral Gains, Dither Amplitude and Speed, if necessary

The VP51 Programmable Digital Proportional Control Valve for industrial pneumatic pressure control applications. The VP51 can be programmed to meet application requirements, and a standard 10 bar unit can be set at any required outlet pressure setting below this value.

**Warranty**
A two-year warranty applies to all Norgren products. For terms and conditions ask for a copy of our ‘General Conditions of Sale.’
Pneumatic Installation:

Supply Pressure: 5 bar minimum supply pressure
1 bar (14.5 psig) above maximum output required
(14 bar 203 psig) max)

Output Pressure Range: 0-10 bar (0-145 psig)

Media: Clean, dry 50µm filtered air

Port Size: ¼” BSP or ¼” NPT

Connect pipe-work using 10mm OD, 8mm ID, plastic pipe, cut cleanly at right angles, with push-fit pipe connections.

Fit an exhaust silencer to Port 3 if required (this will only slightly degrade exhaust performance) The connector plug must be hand-tight only, to a tightening force less than 3 Newtons.

Electrical Installation:

• Power Supply: 24V D.C power supply (± 25% with 250mA current capability)
• Signal: 0-10V, 4-20mA, as ordered
• Monitor: 10V full scale; Switch mode settable

Connect the unit as follows using 5-core, screened cable and the M12 socket connector supplied.

Electrical connector pin looking in to the end of the instrument
Programmable Proportional Pressure Control Valve

User Interface Functions and Descriptions

The VP51 has a 2 x 8 digit alphanumeric display with a permanent backlight, which under normal operation displays the current pressure and input signal. This is referred to as the default screen. By using the keypad, the user can gain access to a range of settable parameters.

The VP51 user interface is navigated using a six-button keypad - Up, Down, Left, Right, OK and Cancel:

- Use the OK button to enter the menu from the default screen, move to the next level of the menu structure and accept changes within functions.
- Use the Cancel (C) button to move back through the levels of the menu structure and to cancel changes within functions.
- Use the Up and Down buttons to move between menu options within a level and to set digit values within functions. Use the Left and Right buttons to move between settable digits within functions.

Offline and Online Range Setup: The VP51 input signal and output pressure ranges can be set independently. For both set points, output pressure can be set at any value between 0 and 10 bar, to the nearest 0.1 bar. Likewise, input signal can be set between 0 and 10V (or 4 and 20mA). It is also possible to set the VP51 to be reverse acting, so that for a low input signal, the pressure is high and vice versa.

**Important:** It should be noted that the Max and Min set points do not become the operating limits of the instrument but are simply the two points required to define the gradient and offset of the straight line characteristic of the VP51. For example, if the Min set point is set to 1.5 Bar at 1.0V and the Max set point is 8.5 Bar at 8.0V then at 0V the output pressure will be 0.5 Bar and at 9V, the output pressure will be 9.5 bar. It should also be noted that the instrument accuracy, as quoted in the datasheet, applies to the product configured as a 0-10 bar instrument. For reduced ranges, the percentage accuracy will therefore decrease.

Getting Access to the VP51 Interface: Press OK from default screen to enter the interface, a password will be requested before entry is permitted. All standard units are shipped with the password disabled. In this mode, press OK to proceed from the password request screen.

**Setting the Password:** The password can be changed through the Device Database menu and can be any four digit combination of the numbers 1, 2, 3 & 4. This is entered by pressing the arrow keys marked with these numbers.

**Disable Option:** Setting password to OK effectively disables the password protection. When the password is requested, user can now simply press OK a second time to enter interface.

**Password Override:** If the password is forgotten, the user interface can be entered and password reset through an override facility. From the password request screen, press and hold down Cancel (C), then press and hold down OK. Hold both down for five seconds, and release both together. The user interface should now have been entered and the password can be reset.

**Timeout:** If no buttons are pressed on the VP51 for over 15 minutes, the VP51 will automatically return itself to the default screen, thus helping to avoid unauthorized access to the user interface. This timeout is not active when the unit is running any of the functions under Local control as this could cause an unpredictable pressure shift.

All VP51’s can be operated in 5 languages (English, French, German, Spanish and Italian) and can be displayed and set in any of 5 standard pressure units (psi, bar, Kpa, atm and Kg/cm²). Use Arrow keys to scroll through language and pressure options. Press OK to accept.

For each set point, both output pressure and input control signal can be set using the keypad. Pressure output can be set between 0-10bar for both Min and Max demand signals. This makes it possible to have a low signal giving a high output and vice versa. To set the VP51 offline, use up and down buttons to change digit value. Use left and right buttons to move between digits.

**WARNING:** Offline setup could cause damage and injury if the VP51 is connected into a system for which the pressure range selected is unsuitable.

The user can set the speed of the iVP51 to an empirical value in the range 0-7 (0 = fastest, 7 = slowest). This is represented in Fig 1. N.B. Response will vary with load volume.

This feature is used as a secondary function to improve the overall hysteresis of the instrument. For most applications the default setting will be sufficient. However in certain applications it may be necessary to adjust it. It should be noted that if dither is set too low, accuracy may be reduced and hunting may occur. Conversely if the dither is too high it may result in excessive spool wear and high air consumption. It can be adjusted using menu presets 0-7, where 0=dither off and 7 = dither max.

These features allows the user to set the proportional and integral gain of the instrument to suit the application. For most applications the default setting will be sufficient. To set the Proportional gain, first set the integral gain to 0, then adjust the proportional gain to give the best possible response time without causing unacceptable overshoot or oscillations.

Once proportional gain is set correctly, increase Integral gain to achieve the best possible accuracy without causing unacceptable hunting (slow oscillations) on the output.

Proportional and Integral gain are set using menu presets 0-7, where 0=low gain, 7 = high gain. See Figs 2 and 3 for examples.
To set the VP51 range online, it must be connected to an air supply and an external input signal as well as the 24V supply signal. Set the input signal to the required maximum or minimum value, then use the up and down buttons to fine tune the VP51 to its host system.

Important: The Online Setup function is only intended for fine-tuning of the VP51. If large adjustments are required to the VP51 range, use the Offline Setup function.

Display function that provides feedback facility for user information.

In the Analog 0-10V mode, the output signal is in the range 0-10V, reflecting the output pressure in bar. When the mode Hi = P2 > XX.X Bar, the output signal is 10V when the output pressure is above the specified threshold and is 0V otherwise. The threshold can be set within this mode.

When the mode Hi=P2 OK, the output signal reflects the state of the red LED-Hi when not flashing.

The Green LED is normally permanently on to indicate power on. It will flash when output pressure is outside a specified window. The output pressure is compared with that required and the green LED will flash when the difference is greater than the green limits value.

Red LED is normally off. Can be set to flash if output pressure does not reach the required value within a specified time limit. Red LED will also flash when running in local control functions.

Important: For large loads and speed settings other than '0' the time delay from stopping the system to the output reaching a selected pressure will be greater than the measured time. Thus the red LED will only flash if the system is failing to respond in the required time.

Local control function enables the user to manually set output pressure using arrow keys. To accept command press OK. This will display an output pressure warning. To return to Remote Control press C followed by OK. This will display the main menu structure.

Manual control is part of the Local Control menu. Within Manual Control the user can set the VP51 to output any pressure between 0 and 10 bar to 3 significant figures, without affecting the end points. The up and down buttons are used to change digit values. The left and right buttons to move between digits.

WARNING: MANUAL CONTROL COULD CAUSE DAMAGE AND INJURY IF THE VP51 IS CONNECTED INTO A SYSTEM FOR WHICH THE PRESSURE CHANGES SELECTED ARE UNSUITABLE.

Display function that shows device ID, Serial No.

Database Contents: Users have read only access to part number, serial number, software version, factory calibration data and run time. All this data is accessible under the Device Database menu.

Tag Number: The VP51 has a user settable eight digit tag. Use the left and right buttons to move between digits.

Help: For further assistance on the VP51, visit the Norgren Website at www.norgren.com

Factory defaults settings can be restored from any user set conditions. At the Factory Defaults menu, press OK and you will be invited to restore defaults. Press OK again and all VP51 settings will be restored to their factory set values as printed on data label.

WARNING: RESTORING FACTORY DEFAULTS COULD CAUSE DAMAGE AND INJURY IF THE VP51 IS CONNECTED INTO A SYSTEM FOR WHICH THE FACTORY SET RANGE (0-10BAR, 0-10V) IS UNSUITABLE.
The VP51 is a programmable electronic proportional control valve. The pneumatic section is a diaphragm actuated precision glandless spool valve, pilot pressure applied to the pneumatic section controls the output pressure of the unit.

The pilot pressure is generated and controlled electronically. The feedback signal from the outlet port is compared to the control signal required and ensures a consistent, stable output pressure.

The electronics system requires a nominal 24V DC supply signal. With a 10 Bar standard unit, the user can define their requirements through programming, and set the application parameters needed for the unit, i.e. outlet pressure, gain settings, response speed, feedback etc.

**MAINTENANCE**

The VP51 does not have components that require user maintenance. If there is a concern or problem contact your regional Norgren Distributor.

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## TROUBLESHOOTING GUIDE

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EC DECLARATION

SPECIFICATIONS

Medium: Compressed air, Non-lubricated
Input/Output Signal  See Product Selector on Datasheet
Supply Pressure Range  Up to 10bar, user adjustable
Prefered Range (low Pressure)  5bar minimum operating pressure
Operating Temperature Range  -20°C to 50°C (ambient)
Dew Point  -20°C pressure at 7bar g in accordance with ISO 8573.1
Environmental Protection  IP65 in normal operation
RFI/EMI Protection is incorporated

TYPICAL PERFORMANCE FIGURES

Accuracy  ±100mbar (1% full 10 bar range)
Supply Pressure Effect  1 bar (14.5 psi) above maximum output required.
Up to 14bar (203 psi max)
Temperature Effect  Typically better than 0.03% of span/°C for span and zero over operating range
Response Time  <80mS (10-90% step into 0.1l load)
Flow Capacity  1300 l/min
Air Consumption (Typical)  <5l/min
Input Impedance  10KΩ for voltage variants 250Ω for current variants
Insulation Resistance  >100MΩ at 50Vdc, electrical terminals to case
Over Current Protection  Over voltage to 30V (non-continuous, 60 seconds)
Variant
Long Term Stability  100-200 million cycles
Rangeability  Multiturn trimpots for zero and span, acessible via removeable grommet. Zero and span pots to provide 50% rangeability (applicable to variants listed in Input Impedance).
Life  >30 million  100% steps

EC DIRECTIVE
89/336/EEC (EMC) and 97/23/EC (PED)
DECLARATION OF CONFORMITY

Watson Smith declares under our sole responsibility that the product listed below

Product: VPS1 Proportional Valve
Manufactured by: Watson Smith Instrumentation
Norgren Ltd.
Cross Chancellor Street.
Leeds, LS6 2HT
England

Representative samples of the VPS1 Proportional Valve have been tested in accordance with conformity assessment procedure to demonstrate compliance with the European Parliament and the Council Directive 97/23/EC; and with the following standards relating to EMC:

BS EN 61000-6-2 : 1999  Electromagnetic Compatibility Part 6 - 2: Generic Standards - Immunity for industrial environments

Signed: P. Hartley
Date: 4/05/05

Name: P. Hartley
Position: Managing Director

Document No. 2009-064A
Date 31 Oct 03
Re-issued: 04 May 05
Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.

UK Office
Keison Products,
P.O. Box 2124, Chelmsford, Essex, CM1 3UP, England.
Tel: +44 (0)330 088 0560
Fax: +44 (0)1245 808399
Email: sales@keison.co.uk

Please note - Product designs and specifications are subject to change without notice. The user is responsible for determining the suitability of this product.