



ORIGINAL INSTRUCTIONS



Refer to Declaration of Conformity for relevant Directives

Instruction Manual
Electro-Pneumatic Regulator

VEX1(3,5,9)0#-###-#-(#)####-(#(W))-X115-Q



The intended use of this electro-pneumatic regulator is to regulate system air pressure via the ITV unit with high flow through the VEX.

Note) For details on ITV units compatible with communication models, please check relevant ITV Operation Manual:

| | |
|-------------|----------------|
| CC-Link | ITV2-OM00078-C |
| DeviceNet™ | ITV2-OM00095-B |
| PROFIBUS DP | ITV2-OM00118 |
| RS-232C | ITV2-OM00116 |

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger."

They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)^{*)}, and other safety regulations.

*) ISO 4414: Pneumatic fluid power - - General rules relating to systems.

ISO 4413: Hydraulic fluid power - - General rules relating to systems.

IEC 60204-1: Safety of machinery - -Electrical equipment of machines. (Part 1: General requirements)

ISO 10218-1: Manipulating industrial robots -Safety.etc.

This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.

- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- To ensure safety of personnel and equipment the safety instructions in this manual must be observed, along with other relevant safety practices.

| | | |
|--|----------------|--|
| | Caution | Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury. |
| | Warning | Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury. |
| | Danger | Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury. |

Warning

- **The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**
- Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be

Safety Instructions - continued

the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

- **Only personnel with appropriate training should operate machinery and equipment.**

The product specified here may become unsafe if handled incorrectly.

The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

- **Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**

1) The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.

2) When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

3) Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

- **Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**

1) Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2) Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustions and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specification described in the product catalogue.

3) An application which could have negative effects on people, property, or animals requiring special safety analysis.

4) Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

- **Always ensure compliance with relevant safety laws and standards.**

All electrical work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

Caution

- **The product is provided for use in manufacturing industries.**

The product herein described is basically provided for peaceful use in manufacturing industries.

If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.

If anything is unclear, contact your nearest sales branch.

2 Specifications

| | | | |
|--|-------------------------------------|--|---------|
| Model | VEX130* | VEX150* | VEX190* |
| Pilot type | Internal pilot, external pilot | | |
| Electro-pneumatic regulator (ITV)series used | ITV105* | ITV205* | |
| Supply pressure | (Set pressure) + 0.1 MPa to 1.0 MPa | | |
| Set pressure range | 0.01 - 0.9 MPa | | |
| Supply voltage | 24 VDC ±10% | | |
| Current consumption | 24 VDC | 120 mA or less | |
| Input signal | Current type ^{Note1)} | 4-20 mA DC, 0-20 mA DC | |
| | Voltage type | 0-5 VDC, 0-10 VDC | |
| | Preset input | 4 points (negative common), 16 points (no common polarity) | |
| | Digital input | 10 bit (parallel) | |

Specifications - continued

| | | |
|---------------------------------|-----------------|--|
| Input impedance | Current type | Maximum 250 Ω ^{Note 2)} |
| | Voltage type | Approximately 6.5 kΩ |
| | Preset input | Approximately 4.7 kΩ |
| Output signal ^{Note3)} | Analogue output | 1-5 VDC (Load Impedance: Approx. 1 kΩ) 4 to 20 mA DC (Sink type) (Output impedance max. 250 Ω) Output accuracy ± 6% F.S. or less |
| | Switch output | NPN - open collector output: Max. 30 V, 80 mA. PNP - open collector output: Max. 80 mA. |
| ▲ Linearity | | ±1.0%F.S. (Full Stroke) or less |
| ▲ Hysteresis | | 0.5%F.S. or less |
| ▲ Repeatability | | ±0.5%F.S. or less |
| ▲ Sensitivity | | 0.2%F.S. or less |
| Temperature characteristics | | ±0.12%F.S./°C or less |
| Fluid/Ambient temperature | | 0-50°C (without dew condensation) |
| Pressure display | Accuracy | ±2% F.S or less |
| | Min. Unit | MPa: 0.001, kgf/cm2: 0.01, bar: 0.01, PSI: 1, kPa: 1 |
| Protection structure | | Main unit: IP65, Cable connector: IP67 |

Note 1) Two wire control, 4 to 20 mA DC and 0 to 20 mA DC are not available. Supply voltage of 24 VDC is required.

Note 2) Value for the state with no over current included. If an allowance is provided for an over current circuit, the input impedance varies depending on the input current. This is 350 Ω or less for an input current of 20 mA DC.

Note 3) Make selection of analogue or switch output; also select NPN or PNP output when switch output is selected.

Note 4) ▲ marked specifications are a guide. Value not guaranteed.

Note 5) Refer to ITV series product catalogue/operation manual for Communication Specifications (CC, DE, PR, RC).

3 Operating principle

When the input signal increases the supply solenoid valve ① turns on and the exhaust solenoid valve ② turns off. Pilot supply pressure (P1) is passed to the pilot valve ③ through the supply solenoid valve. The pilot valve will open allowing partial supply pressure to the power valve ④ which will regulate the power valve main supply pressure (P). The pressure sensor ⑤ will provide output pressure feedback to the control

circuit ⑥. The control circuit will balance the input signal and output pressure to ensure that the output pressure remains proportional to the input signal.

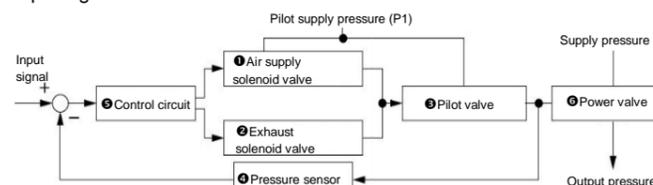


Figure 1 - Control diagram

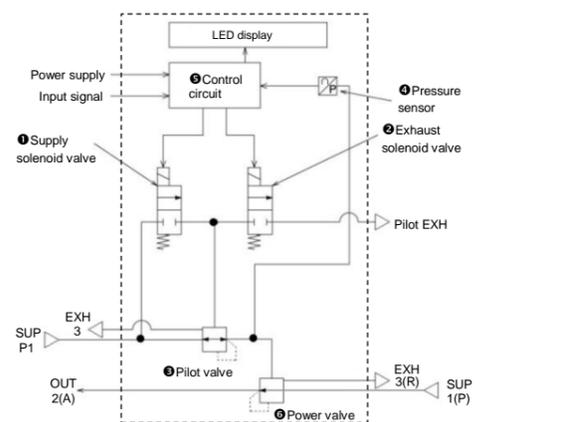


Figure 2 - Schematic diagram

Note) This shows the case of external pilot type. For internal pilot type air from SUP, P is directed to SUP, P1 (therefore SUP, P1 is plugged).

4 Installation

4.1 Installation

Warning

Do not install the product unless the safety instructions have been read and understood.

Caution

- If the electrical supply fails, settings are 'held' for a short period.
- If the air pressure fails with power 'on' the solenoid will 'flutter'. Turn off the power.
- If the monitor output function is not used, ensure that the wire is totally insulated.
- This product is pre-set at the factory and must not be dismantled by the user. Contact your local SMC office for advice.
- Ensure, when installing this product, that it is kept clear of power lines to avoid noise interference.
- Ensure that load surge protection is fitted when inductive loads are present (i.e. solenoid, relay etc.).
- Ensure precautions are in place if the product is used in a 'free flow output' condition. Air will continue to flow continuously.
- Length of connector cable shall be 10 m maximum.

4.2 Environment

Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact. Check the product specifications.
- Do not mount in a location exposed to radiant heat.

4.3 Piping

Caution

- Before piping make sure to clean up chips, cutting oil, dust etc.

- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1.5 to 2 threads exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

| Thread | Tightening Torque [N·m] |
|----------|--|
| M5 | By hand + 1/6 turn with a wrench (1/4 turn for miniature fittings) |
| Rc 1/8 | 7 to 9 |
| Rc, 1/4 | 12 to 14 |
| Rc 1/2 | 28 to 30 |
| Rc 3/4 | 28 to 30 |
| Rc 1 | 36 to 38 |
| Rc 1 1/2 | 48 to 50 |
| Rc 2 | 48 to 50 |

Table 1

Note: G thread options conform to ISO228-1 but ports do not conform to ISO1179-1. See Table 2 for thread depths.

| Model | Thread size | Thread depth (mm) |
|--------|-------------|-------------------|
| VEX130 | G1/2 | 13 |
| VEX150 | G3/4 | |
| VEX190 | G1 | 18 |
| | G1-1/2 | |
| | G2 | |

Table 2

Installation - continued

4.4 Mounting (for bracket option)

4.4.1 VEX130

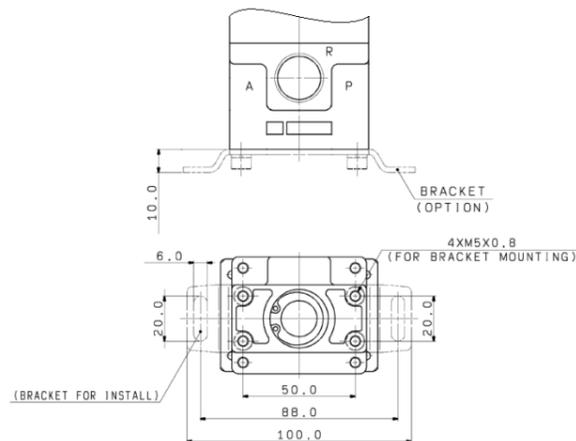


Figure 3

4.4.2 VEX150

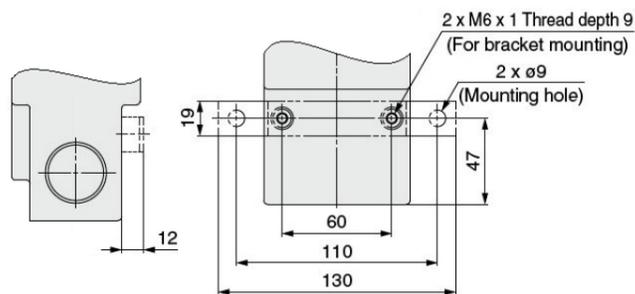


Figure 4

4.4.3 VEX190

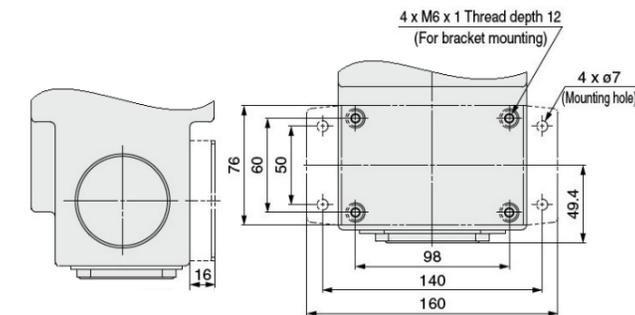


Figure 5

4.5 Lubrication

Caution

- Do not use a lubricator on the input side of this product. If lubrication is necessary, place the lubricator on the 'output' side.
- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, use turbine oil Class 1 (no additive), ISO VG32. Once lubricant is used in the system, lubrication must be continued because the original lubricant applied during manufacturing will be washed away.

5 Wiring

Caution

Connect the cable to the connector on the main unit as shown in the following diagram. Take precautions, as incorrect wiring will damage the unit. Use a DC power supply capable of supplying the necessary power requirements with minimal ripple.

5.1 Current and voltage signal type

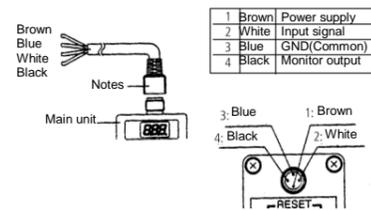


Figure 6 – Connection details

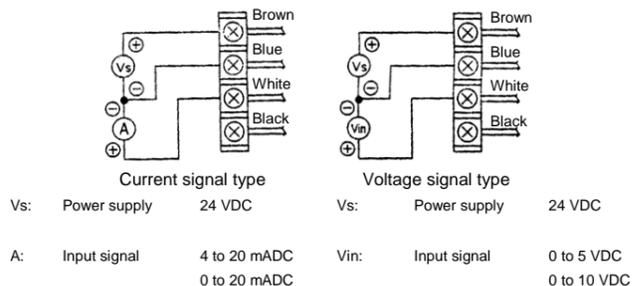


Figure 7 – Wiring diagrams

5.2 4 and 16 points preset input type

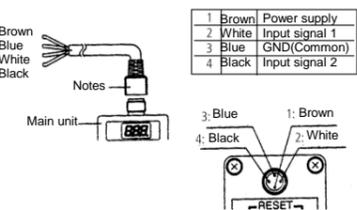


Figure 8 – Connection details

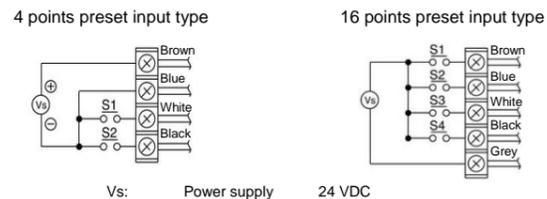


Figure 9 – Wiring diagrams

One of the preset pressures is selected by ON / OFF combination of S1 + S2 as shown in Table 3. For safety reasons it is recommended that one of the preset pressures be set to 0 MPa.

| | | | | | | | | | |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| S1 | OFF | ON | OFF | ON | OFF | ON | OFF | ON | OFF |
| S2 | OFF | OFF | ON | ON | OFF | ON | OFF | ON | OFF |
| S3 | OFF | OFF | OFF | OFF | OFF | ON | OFF | ON | OFF |
| S4 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| Preset pressure | P01 | P02 | P03 | P04 | P05 | ... | P14 | P15 | P16 |

Table 3

Wiring - continued

Preset pressures are set based on the minimum unit for output display shown in Table 4.

| MPa | Kgf/cm ² | bar | psi | kPa |
|-------|---------------------|------|-----|-----|
| 0.001 | 0.01 | 0.01 | 0.1 | 1 |

Table 4

5.3 Monitor output wiring diagram

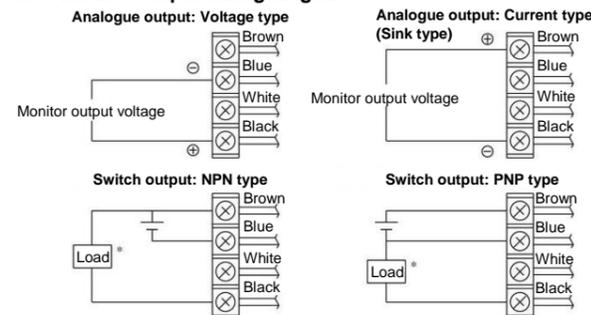


Figure 10 – Wiring diagrams

*When 80 mA DC or more is applied, detecting device for overcurrent starts activating and then emits an error signal (error number "5").

5.4 Communication models

For details on CC-Link, DeviceNet™, PROFIBUS DP and RS-232C please refer relevant Operation Manual as shown on front page.

Caution

Note 1) Right angle type connector is attached facing left of ITV display. On communication models, connector faces opposite direction (right of ITV display). Do not attempt to rotate as connector does not turn.
Note 2) Indicated wire colours are when an SMC connector is used.
Note 3) Refer to ITV series product catalogue for full wiring details.

6 Settings

Caution

When the 'set' key is operated minimum/maximum pressure will be present at the power valve. When primary pressure is applied to the regulator minimum pressure will be present at the power valve. Release 'Key Lock' as explained in section 'Function of Key-Lock'. After releasing key lock, SET needs to be pressed again to get to F-1. To set minimum pressure (display shows F-1) use up/down keys and press 'Set' key to 'Lock' setting. To set maximum pressure (display shows F-2) use up/down keys and press 'Set' key to 'Lock' setting.
Note 1: If the above sequence has been followed correctly, the settings will complete automatically.
Note 2: If only setting minimum pressure, when pressure is 'Set', pressing the set button once more will 'skip' to the next step.

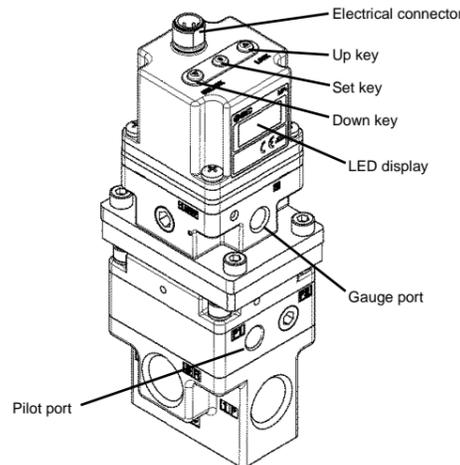


Figure 11 - Key features

7 Function of Key-Lock

The keys are locked after connecting power and cannot be operated. 'Loc' is displayed when any keys are pushed.

- Key-Lock Release
- Push 'Down' key for longer than 2 seconds.
- Display will flash 'Loc' (locked).
- Push 'Set' key to unlock.
- Note: To cancel push 'Up' key.

- Key-Lock
- Push 'Up' key for longer than 2 seconds.
- Display will flash 'unL' (unlocked).
- Push 'Set' key to lock.
- Note: To cancel push 'Down' key.

8 Function of the 'Error' Display

If an abnormality is detected by the ITV the LED display will show 'Er' followed by a code number. Isolate the power supply and ascertain the problem and solve. Reinstall power supply after correcting fault. Error codes are as shown in Table 4.

| No | Content | Display |
|----|---------------------------------------|---------|
| 1 | Input signal is outside specification | Er 1 |
| 2 | EEProm read/write error | Er 2 |
| 3 | Memory read/write error | Er 3 |
| 4 | Solenoid valve fault | Er 4 |
| 5 | Switch output over-current | Er 5 |

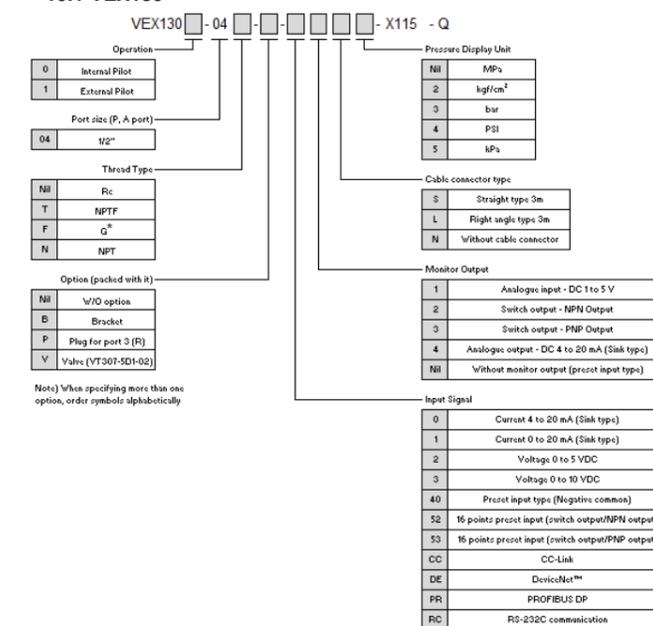
Table 5

9 Reset Function

- Push 'Up' and 'Down' keys (Fig 6) together for longer than 3 seconds.
- Display shows 'RES'.
- Release keys to reset minimum pressure and maximum pressure.

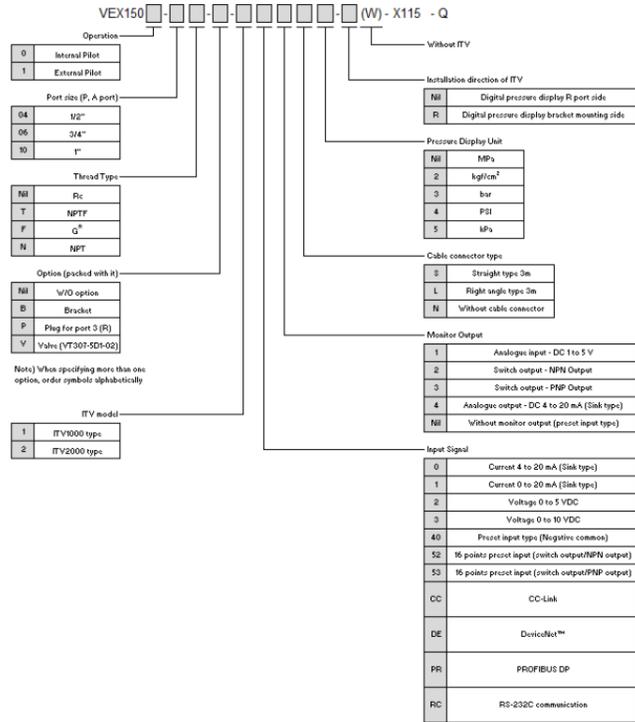
10 How to Order

10.1 VEX130



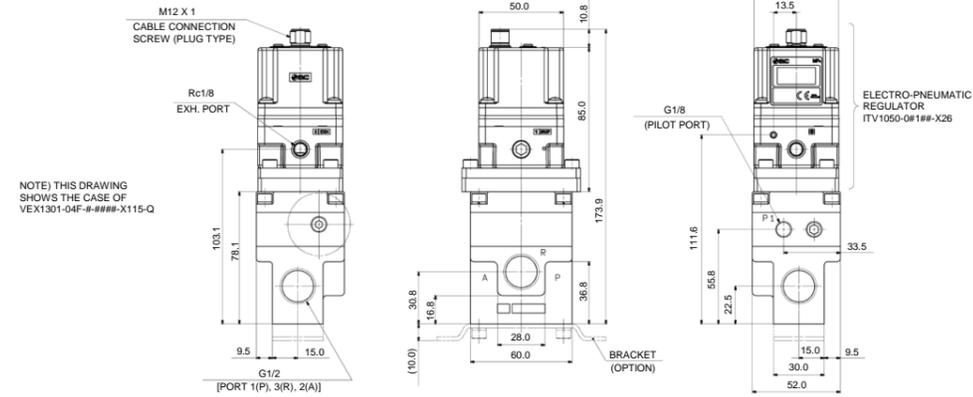
How to Order - continued

10.2 VEX150

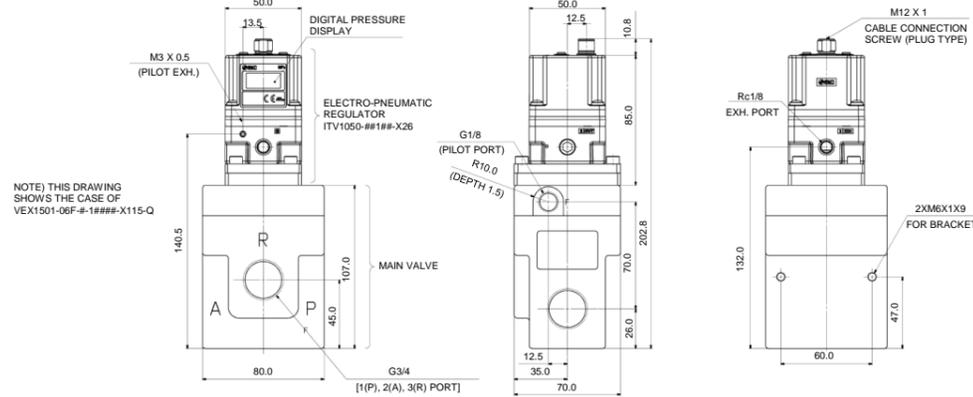


11 Outline Dimensions (mm)

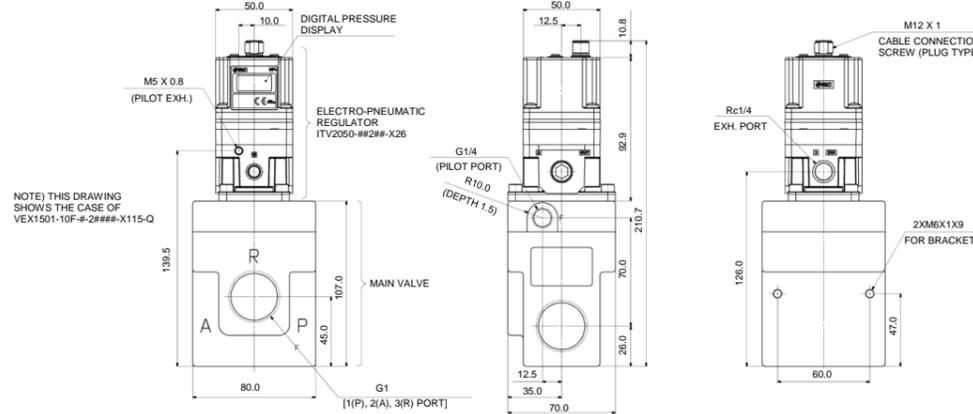
11.1 VEX130#-04#-#-###-X115-Q



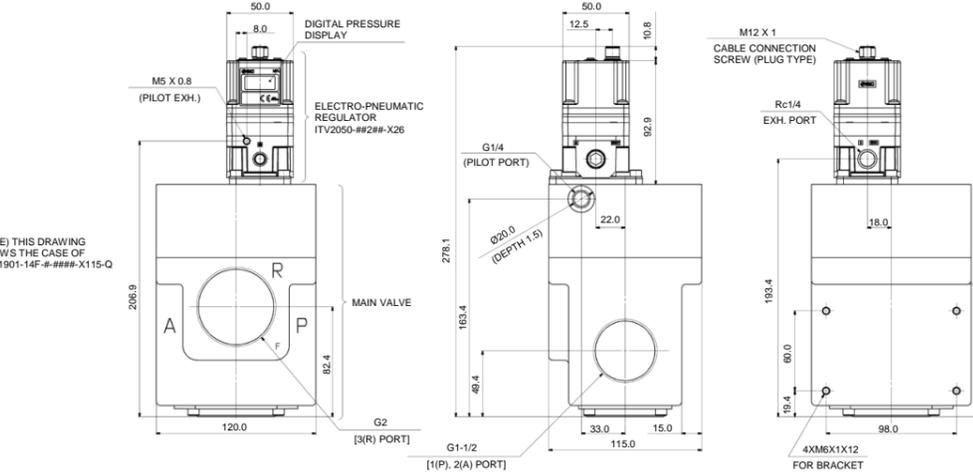
11.2 VEX150#-###-#-1###-X115-Q



11.3 VEX150#-###-#-2###-X115-Q



11.4 VEX190#-###-#-###-X115-Q



Outline Dimensions (mm) - continued

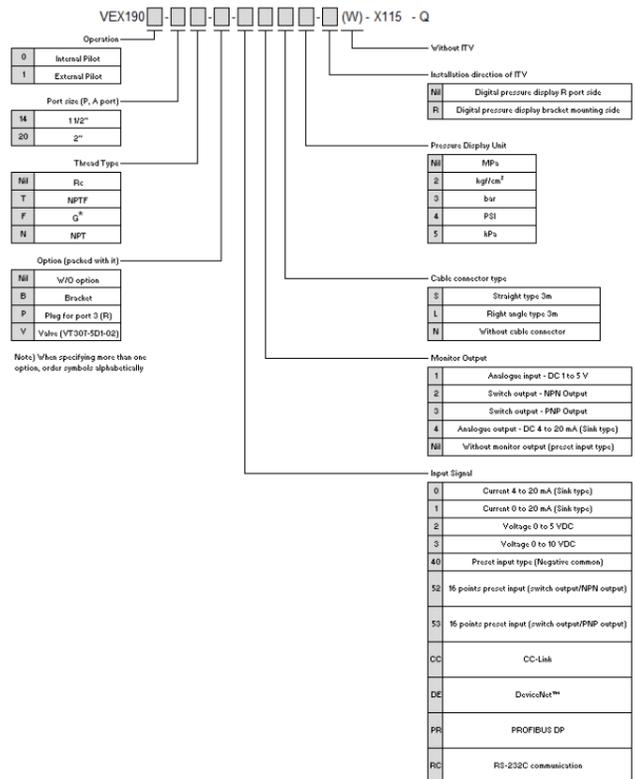
12 Maintenance

12.1 General Maintenance



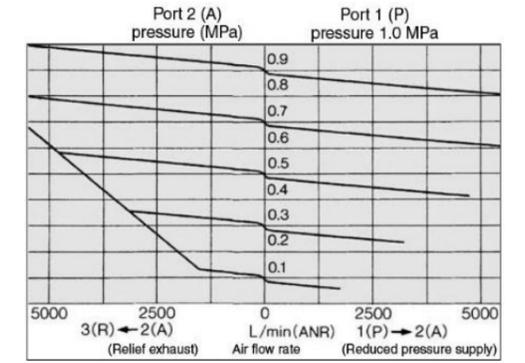
- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous. Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- Ensure all air is exhausted from the product before maintenance.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

10.3 VEX190

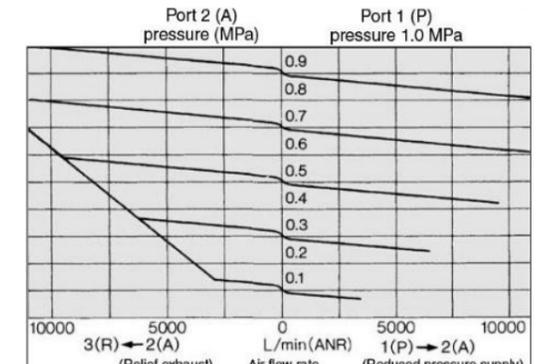


13 Flow Characteristics

13.1 VEX130



13.2 VEX150



*See "4.3 Piping" for note on G thread options.

Flow Characteristics - continued

13.3 VEX190

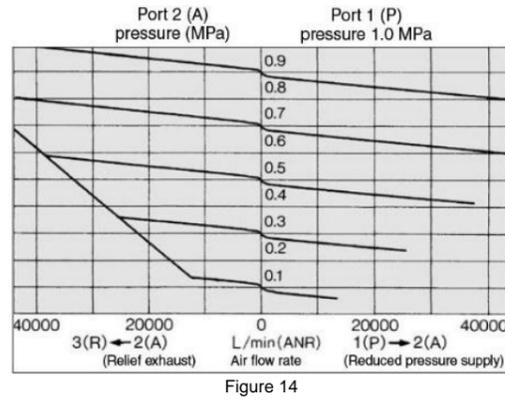


Figure 14

Note) For full flow characteristics please refer to VEX1 series product catalogue.

14 Limitations of Use

14.1 Limited warranty and Disclaimer/Compliance Requirements

- **The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”. Read and accept them before using the product.**
- **Limited warranty and Disclaimer**
 - 1) The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first ⁽¹⁾. Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
 - 2) For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided. This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3) Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.

⁽¹⁾ Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

• **Compliance Requirements**

- 1) The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
- 2) The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Caution

- **SMC products are not intended for use as instruments for legal metrology.** Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country. Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

15 Contacts

| | |
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SMC Corporation

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