Leseprobe

Christiani

Technical Institute for Vocational Training

Basic Principles of Pneumatics

Course 2

SMC

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Ronny Balmer | Basic Principles of Pneumatics
Course 2
1. Auflage 2014
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Table of contents 3

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In industrial automation, there are all kinds of systems and components at work: mechanical, electrical, hydraulic and pneumatic elements are all used to generate motion and force in most cases. Thanks to their simplicity, value for money and excellent reliability – as well as the fact that they have hardly any impact on the environment – pneumatics have really taken hold, and can now be found in virtually every branch of industry.

New industrial sectors with a focus on advanced techniques are where most pneumatic technology is found, although it also has a presence in long-established fields such as machine tools, the food industry, the automotive industry and the electrical industry. Semiconductors and integrated circuits are two examples of recent developments that pneumatics have been involved in: the technology is used in all the manufacturing stages of these components. Industry requirements in this area are growing and changing rapidly all the time, which means that SMC in turn is continually developing new components to accommodate this.

Given the lightning rate at which technology is progressing, it is essential that we are always seeking out ways to broaden and enhance our understanding and knowledge of the latest developments. When it comes to using pneumatic components safely and efficiently, good training is a must.

Because they use the compressible medium of air, pneumatic systems are difficult to design, and in many cases the control elements end up oversized as it takes significant amounts of time and effort to perform the calculations for the physical processes associated with the medium. For that reason, pneumatic applications often turn to empirical values instead.

This course looks at the fundamental aspects and bases of calculation involved in dimensioning key pneumatic components correctly. It outlines the guidelines and empirical values that have proven to work as reliable tools in practical scenarios, and explains the basic principles behind creating pneumatic circuit diagrams.

You will also find a number of fully calculated examples and tables that are designed to help you apply the subject to specific situations. For more in-depth explanations of the designs and symbols of individual components, you should refer to Course 1. This course has also been designed so that you have the option of working through it on your own, without a teacher.

Weisslingen, 20th September 2010

The author
Ronny Balmer

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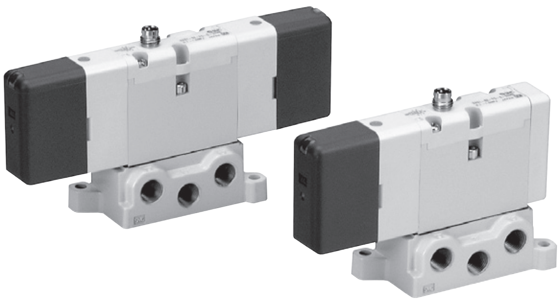

Fig. 6.10: Valves compliant with standard ISO 15407-1 (VDMA 24563), featuring M8 plug connectors

Standardised electrical connection too

ISO 15407-2 and ISO 5599-2 standardise not only the flange pattern, but the electrical connection too. A standardised, pluggable electrical connection is located on the underside of the valve and on the base. Manifold bases generally use multi-pin connectors or a fieldbus connection.

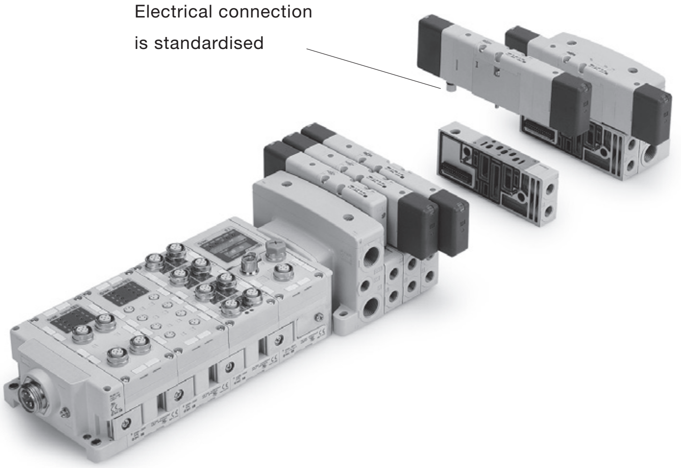

Fig. 6.11: Valve terminals compliant with ISO 15407-2, featuring fieldbus connection

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8.5 Shut-off and flow control valves

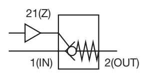
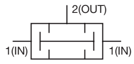
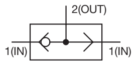
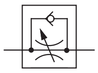
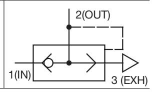
Double check valve		Check valve with spring	
Twin pressure valve (AND function)		Shuttle valve (OR function)	
Throttle check valve		Fast bleeder valve	

Fig. 8.7: Symbols for shut-off and flow control valves

8.6 Actuators

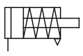
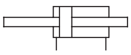
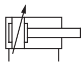
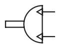
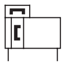
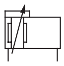
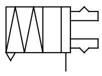
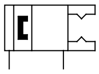
Cylinder; single-acting with return spring, retracted when not actuated		Cylinder; single-acting with return spring, extended when not actuated	
Cylinder; double-acting with magnet		Cylinder; double-acting with continuous piston rod	
Cylinder; double-acting with adjustable limit position damping on both sides		Rotary actuator	
Piston rod-free cylinder, magnetic coupling		Piston rod-free cylinder with limit position damping	
Parallel gripper; single-acting, internal gripping		Parallel gripper; double-acting, with magnet, external gripping	

Fig. 8.8: Symbols for actuators

8.7 Vacuum

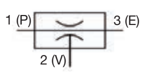
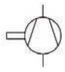
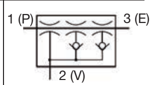
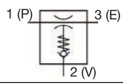
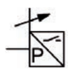
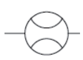
Vacuum generator		Vacuum pump	
3-stage vacuum generator		Vacuum generator with built-in check valve	
Electromechanical vacuum switch		Vacuum switch, electronically adjustable, output signal switching	
Filter		Flowmeter	
Suction cup		Suction cup with check valve and height adjustment	

Fig. 8.9: Vacuum symbols

8

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