

Integrated Field Bus Systems from Rexroth. Perfect Links on Every Level

Field bus structures in pneumatic control technology

BDC

VDS

DDL

CMS



It's great that nothing stays the same forever



Rexroth is right up front when it comes to close encounters with the future. Specialists in our research and development centers around the globe work daily on new solutions to keep that technological lead. We develop pneumatic components that are even smaller and more compact and improve field bus electronics integration in valve units, for example. Wireless solutions are not just a matter for the future. Please contact us if you would like more information. We will be happy to help you find the solutions for tomorrow's projects today.

From conventional wiring to bus technology

As a leading provider in pneumatics worldwide, Rexroth has played a major role in every development for electrical connection technology. All of these systems have been continually improved and each has a special area of application.

Single wiring

Single wiring is a simple and reliable electrical solution for systems that are not very complex. It is so easy to install that machine building would be unthinkable without it today. Single wiring is particularly specified for standards such as EN, VDMA, and DESINA. That is why Rexroth has an entire series with M12 connectors in its range of products. The new ISO valve with an M12 plug pictured below is an example from the series.



Multipole plug units

Assembly time is reduced for valve units with multipole plugs in comparison to single wiring. The versatility and flexibility of our



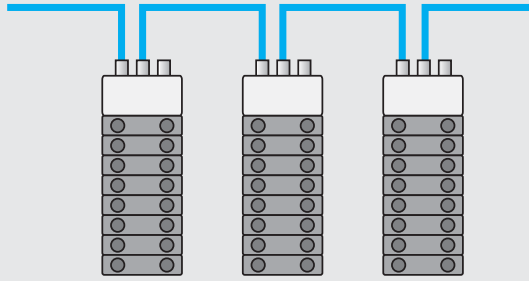
valve systems with multipole plugs help to quickly find solutions for customer-specific automation tasks. Manifolds are delivered fully assembled and tested. Thanks to its modular design, an existing system can be expanded or modified at any time.



Field bus systems

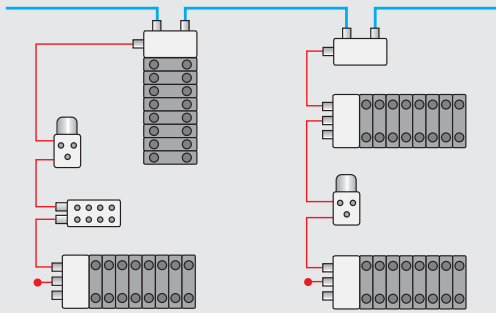
The more complex the controls of a system, the more it pays to use field bus systems. Field bus systems minimize cabling, increase diagnostic capabilities, and reduce the number of possible errors in a system. Our modern data structures not only make fast and secure data transmission possible, but also allow you to perform diagnoses, even of individual valve coils. Each application requires a suitable field bus system solution to get the job done. That's why Rexroth has organized its extensive range of field bus systems into a four-link structure.

Four concepts from Rexroth: Modern bus technology with a structure



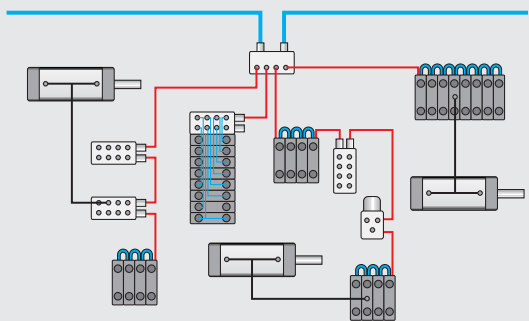
BDC–Bus Direct Control

BDC is the direct link from your pneumatic system to the field bus. The decisive issue is to find the best solution for your requirements and priorities. Extras, such as sensor inputs, are not installed to cut back on costs. The field bus connection runs from unit to unit. A maximum of 32 coils can be controlled per valve unit.



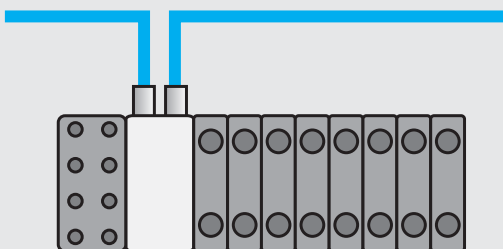
DDL–Drive & Diagnostic Link

This structure is made up of a bus module for communication with the superior field bus and up to 14 participants in the DDL line. Sophisticated diagnostic functions make it possible to quickly recognize and find errors, which significantly reduces downtime in production systems. Not depending on the field bus, the DDL can process 128 inputs and 128 outputs. Analog input and output signals can also be linked.



VDS–Valve Driver System

The link structure with up to four lines—a bus module for communication with the superior field bus is the core of each line. All the valve units and individual valves with A or C plugs in the VDS structure can be controlled via contact bridges. 32 outputs and 32 inputs per VDS line are possible.



CMS–Central Mounted System

The modular and configurable valve block system with integrated bus module and input/output modules offers a mechanically complete unit for applications without additional cabling. A gateway to the AS-i and even control functions can be optionally integrated in the units.

Components for the Rexroth link structures



Everything depends on the qualification profile. Check it out and find the best solutions for your application

Many ways to reach your goal

The shortest way is not always the fastest, the simplest not always the safest, and the most comfortable one is not always the most expensive. The decisive issue is to find the solution that comes

closest to your individual requirements and priorities. Our evaluation table is a helpful tool to select a suitable link structure.

- **BDC–**
Bus Direct Control
- **DDL–**
Drive & Diagnostic Link
- **VDS–**
Valve Driver System
- **CSM–**
Central Mounted System



For example:

Depending on the industry, the tasks to be performed, and the existing working environment, the following specifications have to be fulfilled:

1. The customer wants the system to be as independent as possible from field bus protocols, since his customers use different field bus protocols in their systems.
2. Diagnosis to the valve coil level should be possible.

3. Electropneumatic pressure regulator valves should be included.
4. Addressing of individual participants should be flexible, so that optional system features can be easily controlled via the field bus signal.

Analysis of the most important criteria will provide a recommendation for the link structure that best meets your requirements → **DDL**

Criteria
The system should be as independent from the field bus as possible.
Several valve units will be controlled by the field bus.
Electropneumatic pressure regulator valves will be controlled via the field bus.
Several individual valves will be controlled by the field bus.
Only a few pneumatic components will be controlled via the field bus.
Diagnosis functions will be output.
Binary sensor signals will be processed and output signals set.
Analog input and output signals will be processed.
The separate components to be controlled are far apart from each other.
Addressing of individual participants should be flexible.
Different emergency-off circuits will be used.

Characteristics evaluation

BDC	DDL	VDS	CMS
○	++	+	-
○	++	+	○
○	++	+	○
--	○	++	-
++	○	+	-
-	++	○	-
--	++	++	++
--	++	--	--
++	+	○	++
+	++	--	○
++	++	++	++

- Not suitable

- Not recommended

○ Suitable

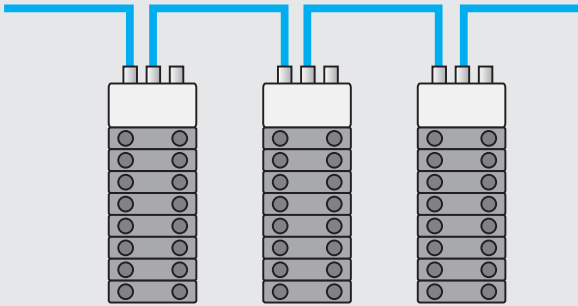
+ Very suitable

++ Extremely suitable

BDC–Bus Direct Control.

Direct connection to valve units

Simple but not simplistic. BDC is the starter for the Rexroth quartet of link structures. This link structure offers universal application possibilities in the most varied environments with its direct link concept.



Every single unit in the entire structure becomes a separate participant with a direct link to the field bus.

Up to 32 (24) solenoid coils can be controlled per valve unit without a separate bus module or additional cabling. This makes BDC powerful, yet simple to handle.

- Compact assemblies with a high density of functions for broad areas of application
- Low installation and field bus connection costs
- Cutting-edge connection technology

As a result of all of this, BDC can always be recommended as the best solution when only a few pneumatic components must be controlled by the field bus. This is also the case if the separate components are set far apart from each other.

The direct PLC link

The BDC structure is particularly convincing because of its simple design. All the components are on a single level and directly connected to the PLC.

Each BDC valve unit is thus a direct participant in on the field bus. Thus, even components that are widely separated can be controlled via the field bus. BDC units have a fantastic price-performance ratio in their main areas of application as a result of their high performance density and the lack of extra features, such as sensor inputs. The BDC structure is especially suited for field bus controlled systems with:

- Few pneumatic actuators
- Pneumatic components that are far apart from each other



The highlight of the BDC structure is the HF04 unit, with electronics seamlessly integrated into the valve block system. All connections in the HF04 face the same direction, which minimizes the required installation space.





V design



S design



A design



I design

Every system has its own specific requirements and thus needs its own special solutions

Rexroth's four different designs for valve systems open up an enormous range of opportunities for the customer: from the standard ISO plug-in to the V15, or the Cube 10 to the HF family.

BDC AS-i—a somewhat different field bus

The "Actuator Sensor Interface" (AS-i) is a system to connect individual binary inputs and outputs for limited data transfer rates and an easier tree structure. The AS-i can create connections of up to 300 m with minimum cabling.



HF03 BDC with DP Profibus

The HF family contains sizes 02, 03, and 04 and thus provides a flow rate range of 400 Nl/min to 1,400 Nl/min.

Kriterien	BDC	DDL	VDS	CMS
Die Anlage soll weitestgehend vom Feldbus unabhängig projektiert werden.	○	++	+	—
Es sollen mehrere Ventileinheiten über den Feldbus gesteuert werden.	○	++	+	○
Es sollen Elektropneumatische Druckregelventile über den Feldbus gesteuert werden.	○	++	+	○
Es sollen mehrere Einzelventile über den Feldbus gesteuert werden.	--	○	++	—
Es sollen nur wenige pneumatische Komponenten über den Feldbus gesteuert werden.	++	○	+	—
Es sollen Diagnosefunktionen ausgegeben werden.	—	++	○	—
Es sollen binäre Sensorsignale verarbeitet und Ausgangssignale gesetzt werden.	--	++	++	++
Es sollen analoge Ein- und Ausgangssignale verarbeitet werden.	--	++	--	--
Die einzelnen anzusteuern den Komponenten liegen räumlich weit auseinander.	++	+	○	++
Die Adressierung der einzelnen Teilnehmer soll flexibel sein.	+	++	--	○
Es sollen verschiedene Notauskreise verwendet werden.	++	++	++	++

BDC leaves all options open

Retrofitting the units in a system from a multiple plug system to a field bus controlled system is as easy as expanding the BDC structure by adding additional units, thanks to the modular design of the valve systems. You can simply integrate more features into your control sequence by adding another field bus participant.

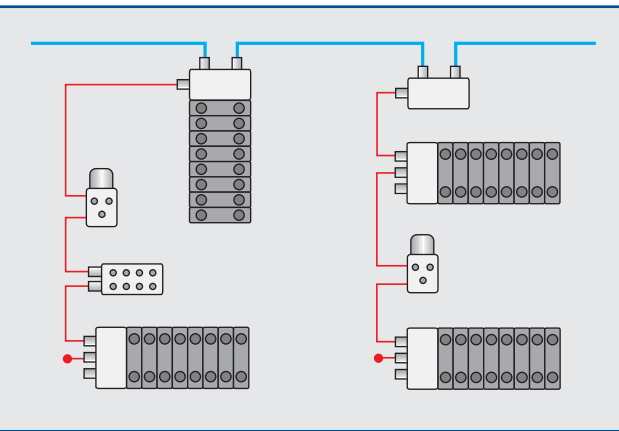


V15 BDC with Profibus-DP

The bus module is smoothly integrated into this unit in the innovative V15 family.

DDL–Drive & Diagnostic Link. Field bus connection with a detailed functional diagnosis

The Rexroth Drive & Diagnostic Link (DDL) is a system to control solenoid valves, pressure regulator valves, and digital and analog I/O modules independent of field bus protocols.



This means that control sequences can be independently designed and connected to standard field buses using the appropriate DDL bus modules.

The illustration on the right shows the different combination possibilities for our DDL components within DDL lines.

Everything in a single line

A bus module used to communicate with field buses is the first component in every DDL line. It is not important which field bus protocol is used with the DDL line itself. The system control sequence can thus be designed independent from the field bus protocol, which means that the number of parts can be greatly reduced.

The length of a DDL line, from the bus module to the last participant, can be up to 30 m at standard transmission speeds.

The transmission technology used assures a very high level of data security. Switching states can be called up at any time using the field bus, thanks to the DDL



system diagnosis function, which simplifies troubleshooting and reduces machine downtime.



DDL Components

The DDL product range from Rexroth currently has the following components:

- Stand-alone bus modules
- Bus modules with drivers
- Valve driver
- Valve block systems
- Digital I/O modules
- Analog I/O modules
- Pressure regulator valves

Function and diagnosis

Per bus module, DDL provides 128 inputs and 128 outputs that are independent from the field bus. Detailed diagnosis functions allow you to carry out remote diagnoses from a PC. The DDL participants and the power supply are monitored in this manner. In addition, the coils in valve units are monitored for short circuits.

Some DDL participants also allow you to set a reaction to a field bus failure by adjusting software parameters. By linking the diagnosis data to report messages by sensors, pressure regulator valves, and by appropriate programs in the PLC, the status of the system is quickly and clearly displayed.



Pressure regulator valve



V design

The illustration shows a DDL valve driver from the HF valve family. An external voltage supply is optionally available.



S design

S design modules are available as bus modules, bus modules with integrated valve drivers, and also simple valve drivers.

Criteria	BDC	DDL	VDS	CMS
The system should be as independent from the field bus as possible.	○	++	+	-
Several valve units will be controlled by the field bus.	○	++	+	○
Electropneumatic pressure regulator valves will be controlled via the field bus.	○	++	+	○
Several individual valves will be controlled by the field bus.	--	○	++	-
Only a few pneumatic components will be controlled via the field bus.	++	○	+	-
Diagnosis functions will be output.	-	++	○	-
Binary sensor signals will be processed and output signals set.	--	++	++	++
Analog input and output signals will be processed.	--	++	--	--
The separate components to be controlled are far apart from each other.	++	+	○	++
Addressing of individual participants should be flexible.	+	++	--	○
Different emergency-off circuits will be used.	++	++	++	++

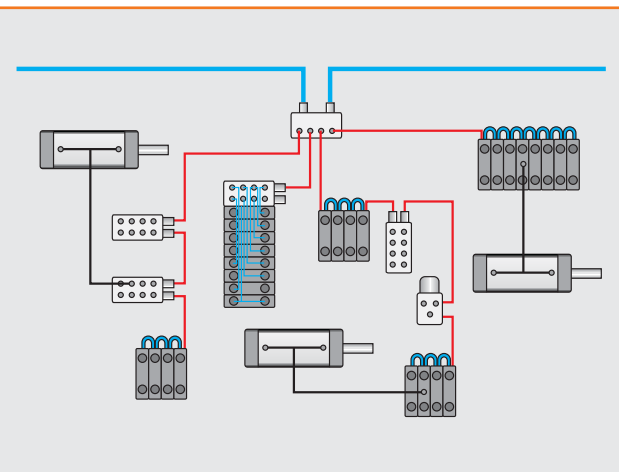
DDL Properties

- Diagnosis to valve/coil level
- High data security
- Independent from field bus protocol
- 1 line for 128 bit I/O
- DDL M12 connection (5-pin)
- Fast data transmission
- Up to 30 m cable length per line
- Easy handling
- Combination options for 14 different components per line
- Up to 14 participants per line
- Small sized bus modules and valve drivers

VDS–Valve Driver System.

A complete, modular, and flexible link structure

Bridges provide a direct connection and an intelligently arranged network of bridges creates a perfect infrastructure with traffic flowing smoothly. VDS—a smart structure with four good connections and lots of direct contact bridges.



Modular intelligence with many advantages

As many pneumatic actuators can be controlled as needed in the VDS structure via contact bridges or valve driver modules. The coupling to the field bus is established using a bus module, which, depending on the field bus protocol, provides 2 or 4 VDS lines, each with 32 inputs and 32 outputs. In the separate lines the individual valves, "modular valve systems" (MVS),

electropneumatic pressure regulator valves, input and output modules, as well as inputs via contact bridges can be freely combined with each other. The contact bridge is the heart of this link structure, even individual valves can be controlled by it using a field bus signal.

- Field bus-independent design possible
- Almost all valves with DIN EN A or C plugs can be controlled
- For all standard field bus protocols
- Extremely modular thanks to contact bridges
- Emergency-off function
- Very convenient inputs possible via contact bridges
- Up to 4 lines with 5 or 10 m length
- Line error diagnosis in the F design





VDS makes sensor connection possible

The evaluation of sensor status is a prerequisite for process security in virtually all automation applications. Information must be reported to the controller and evaluated, and subsequent program steps have to be initiated. Primarily cylinders and pressure switches are automatically monitored via their sensor messages in pneumatic systems.

The concept of the VDS link structure is especially beneficial in this case thanks to uniform integration of the sensors in the individual components.

Contact bridges for large-scale modularity

The valve is connected to the bus module by means of plug-in contact bridges. These bridges are connected to each other by cables and contain the valve drivers as well as the sensor electronics for the sensors. A valve unit can be equipped with up to 16 valves and connected to the bus module by bridges. A wide variety of VDS contact bridges can be used here, depending on the valve series or type, which provides you with unlimited modular flexibility. With the C design, F design and the varied contact bridges, the connection of the separate components to the pneumatic valve systems is both versatile and extremely economical.



Contact bridge

The contact bridge can be installed in almost any valve with a DIN EN A or C plug connection.

Criteria	BDC	DDL	VDS	CMS
The system should be as independent from the field bus as possible.	○	++	+	—
Several valve units will be controlled by the field bus.	○	++	+	○
Electropneumatic pressure regulator valves will be controlled via the field bus.	○	++	+	○
Several individual valves will be controlled by the field bus.	--	○	++	—
Only a few pneumatic components will be controlled via the field bus.	++	○	+	—
Diagnosis functions will be output.	—	++	○	—
Binary sensor signals will be processed and output signals set.	--	++	++	++
Analog input and output signals will be processed.	--	++	--	--
The separate components to be controlled are far apart from each other.	++	+	○	++
Addressing of individual participants should be flexible.	+	++	--	○
Different emergency-off circuits will be used.	++	++	++	++



C design

The standard bus module in the VDS structure with a convincing price-performance ratio. Connection is by means of a mini DIN plug.

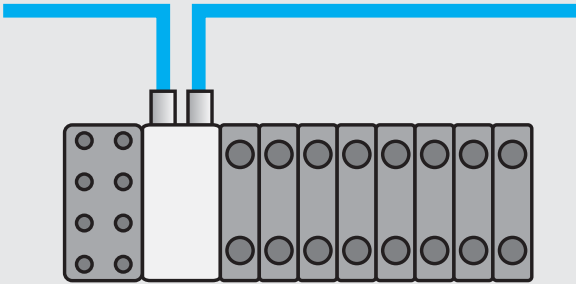


F design

The VDS bus module with line diagnosis. Connection of the individual lines, which can be up to 10 m long, is by means of an M12 plug.

CMS—Central Mounted System.

Compact modular valve terminal system with sensor inputs



M design

The HF valve family bus module with an optional AS-i gateway.

CMS is the perfect solution if you want to reduce the planning and installation effort for the pneumatic controlling of your system to a minimum. Unpack it and connect it—there could hardly be anything easier than that.

Increasing automation of production lines frequently means an increase in time and effort for installation. Our completely



F design

This special field bus connection is tailor-made for applications with our ISO plug-in valves.



L design

Interbus with fiber-optics. The bus module with "rugged line" plug connectors to connect the fiber-optic "rugged line" field bus cable.



cabled CMS valve block system can be used as a switching center in a complex control sequence.

Each CMS unit contains a bus module, a valve block system, and input modules that are assembled and tested according to your individual configuration. This high-performance, complete modular system can be put into full operation in your system within a very short period of time. CMS valve block systems are available in various designs to meet the widest demands.

- All standard field bus protocols
- Integrated input modules in the valve block system
- Integrated output modules in the valve block system
- Valves with various flow rates can be blocked together
- Easy installation on walls
- Fiber-optics technology

The individually configured valve block systems from Rexroth offer you a very broad product range for innumerable applications.



Although valve block systems are rigid units, they are nevertheless characterized by their versatility and flexibility. You can choose from numerous options when configuring the unit with the product configurator. Other features include a power module for an additional voltage supply as well as various input and

output modules. An AS-i gateway can be integrated into the unit for valves set individually on the periphery of the system.

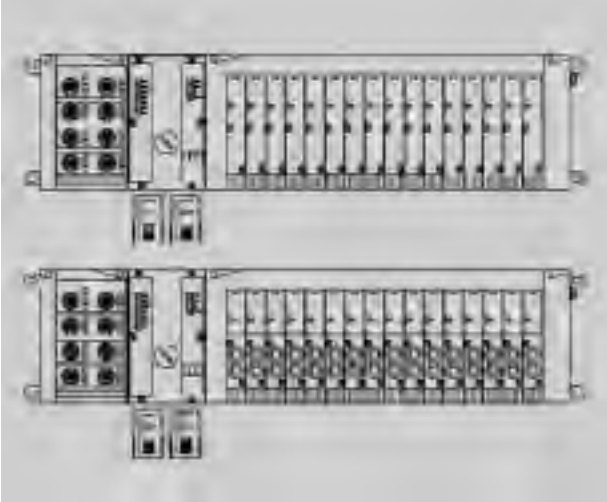
HF valve with fiber-optics

Fiber-optic systems are frequently used in harsh industrial environments, since optic signals are not sensitive to electromagnetic influences. Polymer fibers also allow you to bridge greater distances between individual participants. Another advantage is that the individual components can be installed securely and easily.

Criteria	BDC	DDL	VDS	CMS
The system should be as independent from the field bus as possible.	○	++	+	-
Several valve units will be controlled by the field bus.	○	++	+	○
Electropneumatic pressure regulator valves will be controlled via the field bus.	○	++	+	○
Several individual valves will be controlled by the field bus.	--	○	++	-
Only a few pneumatic components will be controlled via the field bus.	++	○	+	-
Diagnosis functions will be output.	-	++	○	-
Binary sensor signals will be processed and output signals set.	--	++	++	++
Analog input and output signals will be processed.	--	++	--	--
The separate components to be controlled are far apart from each other.	++	+	○	++
Addressing of individual participants should be flexible.	+	++	--	○
Different emergency-off circuits will be used.	++	++	++	++

The cost for fiber-optics

The installation costs for a fiber-optic INTERBUS network are clearly higher than those for a standard system with copper cables. These additional costs are due to the slightly higher prices for fiber-optic modules. However, the higher price is balanced out by technical advantages during installation and start-up.



Well prepared for any situation. Pneumatic solutions from Rexroth are at home in all modern field bus environments



The integrated field bus program from Rexroth offers an appropriate solution for every task.

No matter what industry or production level; for completely equipping fully automatic production processes or optimally connecting individual pneumatic solutions. The entire valve program can be connected and pneumatic components controlled with the 4 link structures and matching design variants. A high level of flexibility and neutrality in planning is guaranteed, not least by the fact that our range can be used with all standard field bus protocols.



Assembly technology

Pneumatic components from Rexroth move, position, and assemble parts, control automatic parts handling and support manual assembly with special balancer systems.



Testing technology

Rexroth pneumatic solutions take over the precise positioning of test objects and connection units, as well as secure them for testing during the final testing of engines and gears.



Vacuum technology

Vacuum technology provides a powerful, yet sensitive grip for moving parts. Rexroth offers sophisticated vacuum technology for handling a wide variety of products, materials, and parts with a huge range of specific industrial solutions.

BDC–Bus Direct Control

V design

- Profibus DP
- Interbus S
- Interbus with remote installation bus
- CANopen
- DeviceNet

S design

- Profibus DP
- CANopen
- DeviceNet
- AS-i

A design

- AS-i standard module
- AS-i with sensor inputs
- AS-i with external voltage supply
- AS-i with external voltage supply and sensor inputs

I design

- n AS-i for contact bridges

DDL–Drive & Diagnostic Link

V design

- Valve driver
- Valve driver with external voltage supply

S design

- Profibus DP
- Interbus S
- CANopen
- DeviceNet
- Control Net
- Valve driver
- Valve driver with external voltage supply



VDS–Valve Driver System

C design

- Profibus DP
- Interbus S
- CANopen
- DeviceNet

F design

- Profibus DP
- Interbus S
- CANopen
- DeviceNet
- Remote I/O

S design

- Valve driver
- Valve driver with external voltage supply



CMS–Central Mounted System

M design

- Profibus DP
- Profibus DP with integrated PLC
- Interbus S
- CANopen
- DeviceNet

F design

- Profibus DP
- Interbus S
- CANopen
- DeviceNet
- Remote I/O

L design

- Interbus with fiber-optic connection

The Interactive Designer—the fastest way to a perfect pneumatic configuration

The Interactive Designer on the Rexroth homepage provides you with the support you need for all your business activities. The range of services offered extends from the complete product catalog to possibilities for individual configuration and also online ordering.

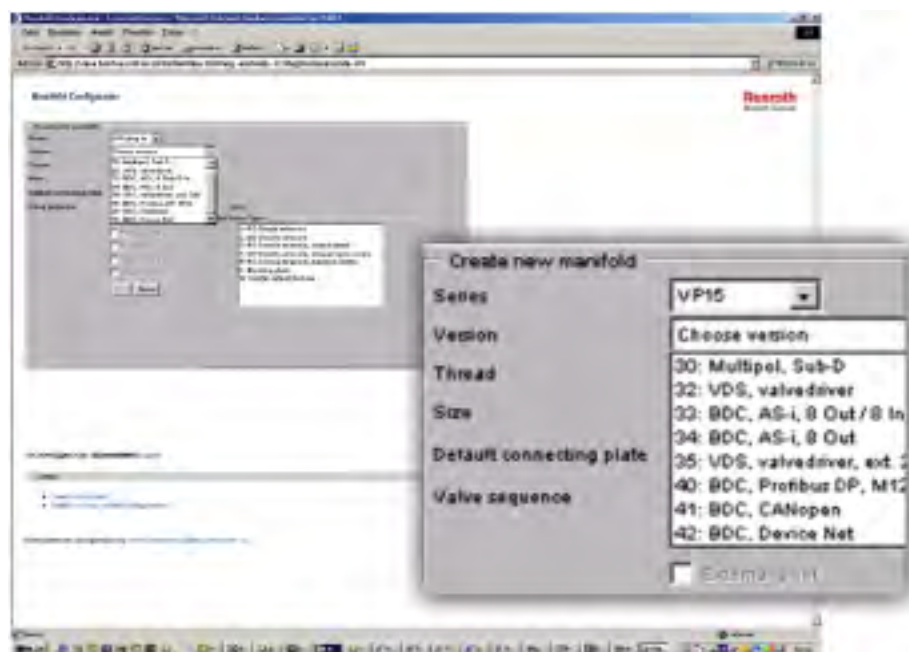
Working with the Interactive Designer

Our pneumatic design tools cover product calculation programs, a CAD library, product configurators, the product catalog, and a shopping cart that you can use to check prices online, find out availability and order status, and place your order. You can use our product configurator to configure our core products to fit your specific application.



Product configuration

After you have decided on a product family, you can choose between the individual link structures and field bus systems. The system generates a product according to your specifications with its own order number. Finally, the configured unit drawing is available in various CAD formats for you to download.



This is how to do it:

1. Go to
www.boschrexroth.com/interactivedesigner
in the Internet.
2. Click on "Configure".
3. Select the product family that you would like to configure by clicking on the image or button.
4. Now you can configure the product to fit your requirements. The configurator checks your options and after you click the "save" button it provides you with a new product number specially generated for this configuration, along with a price for the complete package.
5. Available CAD formats are Pro/E (2000i), STEP, IGES, DXF, DWG, JPG, and VRML.
6. Click "add to shopping cart".
You will be informed on the

prospective delivery date and net price.

You can find further information on your order at:

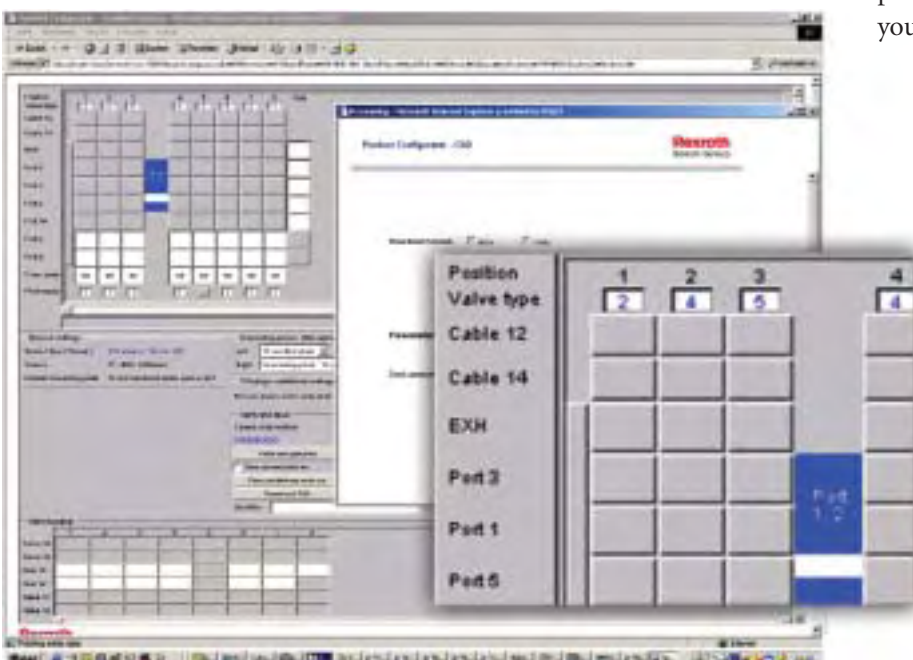
- Inquiries and orders
- Order status



An all-around solution

Using Rexroth's Interactive Designer, you have a unique tool to help improve your business activities.

You can save and print each product description or data sheet as a PDF or HTML document. The configurator will help you put together products to meet your specific demands.



You still have questions?

No matter where you are in the world, you can get in touch directly with the sales office nearest to you by clicking on "Contact". We will be glad to help you.

Bosch Rexroth AG
Bartweg 13
D - 30453 Hannover
Phone +49 - 5 11 - 21 36 - 0
Fax +49 - 5 11 - 21 36 - 269
sales-pneumatics@boschrexroth.de
www.boschrexroth.com/pneumatics

Your contact:

UK

Bosch Rexroth Ltd.
Pneumatics
Broadway Lane
South Cerney
Cirencester
Gloucestershire, GL7 5UH
Phone + 44 - 12 85 - 86 30 00
Fax + 44 - 12 85 86 30 30

US

Bosch Rexroth Corporation,
Pneumatics
P.O. Box 13597
1953 Mercer Road
Lexington, KY 40511-1021
Phone + 1 - 8 59 - 2 54 80 31
Fax + 1 - 8 59 - 2 54 41 88

Subject to alteration. This edition
supersedes all previous ones.
No part of this edition may be
reproduced without our prior
permission.
Printed in Germany.
Order no.
885-890-287-3/06.03/EN