EN

Energy Saving

METAL WORK PNEUMATIC

Introduction

Compressed air is used for the majority of industrial applications. It is estimated that, on average, the energy required for the generation of compressed air has a weight of about 20% of the total consumption of a company.

Of this amount, about a third could be saved through three types of synergistic actions:

- use of suitable products
- component sizing
- measurement of consumption and losses, followed by corrective actions

Products

The cost of pneumatic energy is directly linked to two fundamental quantities: the pressure and the flow rate of compressed air. The first is a function of the force required by the actuators and the second depends on the speed of movement of the actuators.

The choice of quality products, designed for flow optimization and friction reduction, is the first step to ensure a significant reduction in consumption. By decreasing the mechanical friction in the products, a better performance is guaranteed and, therefore, better performance of the actuators at the same energy consumption. In the same way the improvement of the conditions of passage of the pneumatic fluid inside the components and the pipes reduces the pressure drops and, consequently, increases the efficiency of the system.

Metal Work pays a lot of attention to these aspects, choosing quality materials, lubricants and components and carefully studying the internal geometry of products, also through the use of advanced tools for fluid dynamics analysis. The technical choices are then validated by laboratory tests to guarantee the quality of the products.

Metal Work also offers a series of products specifically dedicated to reducing energy consumption.

Measure, understand, intervene

If we want to deal systematically with the issue of reducing consumption, the first step is to measure the fundamental quantities involved, namely pressure and flow rate. Only in this way it will be possible to intervene with strategies aimed at improving the situation, be they of a design type, inserting specific components or modifying existing ones, or of a maintenance type, intervening in a programmed manner.

For this purpose, Metal Work provides a series of digital components capable of measuring both quantities and providing the machine control system with the data necessary to process the various intervention strategies.

Flowmeters

The first quantity to be measured in order to monitor the consumption of a pneumatic circuit is the flow rate of compressed air consumed. For this purpose Metal Work offers the flowmeters of the FLUX Series, capable to measure flow rates ranging from 50 to 15,000 Nl/min.

Typically the FLUX 0, of miniaturized type and for flows ranging from 50 to 200 Nl/min, are used to detect leaks or control flow rates in confined areas. Powered with voltage from 12 to 24 VDC, they are equipped with a three-color display that allows you to view and set numerous functions. They have 2 digital and one analog outputs, each of which can be freely set to measure instantaneous flow rate, cumulative flow rate or pressure, so they can perform the function of flowmeter, flow switch, pressure gauge or pressure switch.

The FLUX 1, 2, 3 and 4, consisting of a robust anodized aluminum body on which the electronics are mounted, measure capacities up to 15,000 Nl/min . Used individually or integrated into a Syntesi group, they can be mounted both upstream of the plant and in various branches. They are available with or without display, always with M12 connector for power supply and signal control. The devices can be powered with voltage variable between 12 VDC (-10%) and 24 VDC (+30%). The versions with display also feature a pressure and temperature transducer that, thanks to the algorithm implemented in the device software, allows to minimize the measurement error within the temperature range indicated in the catalogue. The display shows the flow rate, pressure and temperature values as well as graphs of instantaneous and cumulative values. The electrical power value used to produce the measured flow is also calculated and displayed.

From the communication point of view, a PNP digital output - configurable on the flow rate, pressure or total consumption value - and an analogue output which can be set in voltage (0-10 VDC) or in current (4-20 mA) are available. Versions with IO-Link interface with similar characteristics are also available. The FLUX 1, 2, 3 and 4 can therefore also be used as a flowmeter, flow switch, pressure gauge or pressure switch.

Also available for FLUX size 1, 2, 3 and 4 are the Wireless versions, able to communicate with Ethernet networks (via MQTT communication protocol) and mobile devices, such as smartphones and tablets with Bluetooth® connection through a dedicated APP developed by Metal Work. Through the APP, in addition to viewing the measured quantities, it is possible to change all the flowmeter settings and view the measured values in real time. In this way our FLUX can be configured and monitored without the need for a physical connection.

The Metal Work FluxUp APP, in fact, allows the connection via Bluetooth®, from smartphone, to the Metal Work flowmeters of the FLUX 1, 2, 3 and 4 series, equipped with Wireless interface. Through Metal Work FluxUp it is possible to view in real time all the data collected by FLUX and set all the operating parameters.

The Wireless versions of FLUX 1, 2, 3 and 4 allow the connection to a Wi-Fi® network through an Access point or a Gateway, to monitor and acquire all the measured quantities of the gas in question. For this purpose, the MQTT communication protocol is used, a widespread standard for this type of application. Our FLUX are therefore compatible with all advanced diagnostic and predictive data collection and processing systems.

The collection of data from the field allows to carry out a predictive diagnosis of the system: it allows to keep the operating parameters under control and to optimize the operation of the machines and the pneumatic system; it allows to identify leaks in order to avoid energy waste. The software can be implemented with analysis functions that allow the control of machine efficiency as well as consumption trends and long-term prediction (plant improvement evaluation).

Once the application parameters have been set, each individual FLUX will be able to monitor the specific section of the plant in which it is installed, sending the system operator energy consumption data as well as any alarms due to excessive leaks or breakages.

Digital pressure switches

For the second quantity to be measured, i.e. pressure, Metal Work offers a series of digital pressure switches that, used individually or mounted on the manometer sockets of the air treatment units, provide precise and reliable values to the machine control system. Two digital outputs are available that can be set according to two pressure values reached. There is also an analogue voltage output proportional to the pressure reading. The digital pressure switches have a clearly visible LED display and a keyboard for settings. A version with IO-Link interface is also available.

Proportional pressure regulators

Metal Work offers a wide range of devices able to regulate with extreme precision the pressure (and in some cases also the flow, indirectly) of compressed air in the various areas of the pneumatic circuit, thus allowing control of the parameters related to energy efficiency.

The proportional pressure regulators of the Regtronic Series include miniaturized versions with M5 threads for those who need reduced dimensions, medium-sized versions, with 1/8" or 1/4" threads, for more frequent use, and regulators with 2" threads for those who need high air flow rates. Depending on the model, the maximum flow rate ranges from 10 to 20,000 liters per minute.

All models are available in version with display and control keypad or with M12 connector for remote control; they can be chosen in version with analogue control system or in IO-Link version.

The Metal Work proportional pressure regulator has also been integrated into the EB 80 Series solenoid valve islands (both multi-pole and fieldbus), maintaining their flexible modularity characteristics. The versions for islands in fieldbus are controlled through the island terminal itself, while the versions for multi-pole islands are equipped with their own M12 connector for electrical communication.

Available in the version with display and manual control keypad or in the remote control version (without display), it has an IP65 degree of protection as standard: in order to obtain this characteristic without losing accuracy, each regulator is equipped with an internal over-pressure compensation system able to maintain the declared protection.

Shut-off valves

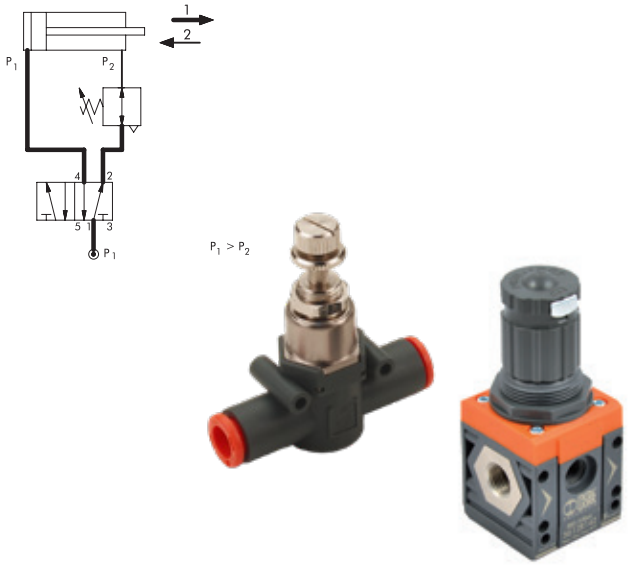
Compressed air leaks in the plant lead to waste of high economic value. In addition to the consumption of electricity required to produce compressed air, there are also possible damages related to the fact that the compressor is stressed more than necessary, even when the plant is not in operation.

It is therefore important to periodically monitor the pneumatic system in order to detect unwanted leaks and puffs. It is also important to have, upstream of the plant and on specific sections of the plant, one or more shut-off valves that close the circuit avoiding the pneumatic supply to stationary machines. In this way both accidental losses and those related to production needs, such as cleaning puffs, are avoided. Metal Work offers both standard shut-off valves and shut-off valves with position control (Safe Air) that provide an electrical signal relative to the exhaust state of the system.

Economizers

Many applications require the use of cylinders that exert thrust only in one direction, for example at the rod exit, while a lower thrust and therefore a lower pressure is sufficient in the other direction (think, for example, of pressing or lifting applications): in these applications it is possible to save a lot of energy by mounting an economizer valve on the line; this component has the function of reducing the supply pressure to the cylinder chamber and facilitating the passage of air in the exhaust phase. In this way the pneumatic energy is used only in the phase of real need.

With reference to the diagram in the figure, if, for example, it is necessary for a cylinder to push with full force in the rod extension phase, while the retraction can be carried out at reduced pressure, it is possible to mount a Metal Work Series Line On Line reducer in the section of the circuit pneumatic running from the control valve to the front cylinder head.



In the same way it is also possible to use the pressure regulators of the Syntesi Series that, being natively made in the quick discharge version, can be inserted between valve and cylinder, thus performing the same function as the Line On Line reducers in case superior flow rates are required.

Booster

Sometimes it is necessary to have high pressure only in some specific points of the plant, without raising the pressure level in the rest of the plant. Think, for example, of areas where, continuously or occasionally, it is necessary to have actuators that can provide a high force. The general increase in the pressure level throughout the plant would lead to higher consumption, increasing leaks and forcing to oversize the compressor room. In situations like these, it is particularly useful the use of localized Metal Work Boosters, that allow to have high pressures only where they are really needed.

A wide range of rod seals

Metal Work offers a wide range of rod seals for pneumatic cylinders, designed for the various application needs and which allow for an excellent and long-lasting pneumatic seal, thus significantly reducing leaks over time. It also offers bellows protections that improve the working conditions of the rod seals over time.

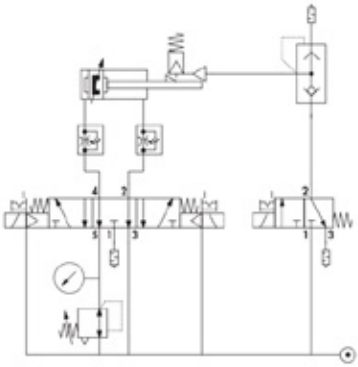
Ultra Low Friction Cylinders

The efficiency of a pneumatic application also depends on the reduced friction of the moving parts. In a pneumatic cylinder, for example, the sliding friction due to gaskets greatly affects the performance of the actuator.

In this regard, Metal Work offers a series of cylinders compliant with ISO 15552 standard in Ultra Low Friction version, where the choice of gaskets, lubricant and internal processing allows the starting pressure and operating friction to be reduced up to ten times, with consequent improvement in the efficiency of the system.

Rod locks and end-of-stroke stops

In some applications, especially with vertical cylinders, it is necessary to maintain the pneumatic supply in a cylinder chamber in order to ensure that the rod (and the load connected to it) does not move. Considering that leaks may occur over time even during the pressure maintenance phase, it is possible to use a mechanical stop device which avoids the need to keep the cylinder chamber under pressure even during downtime.



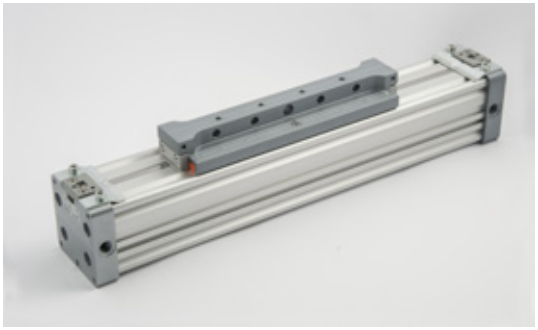
In this regard, Metal Work offers both ISO 15552 cylinders with end-of-stroke stop, which allow the rod to be retained at both ends of the movement, and the rod locks of the Secure Lock and RL Series, which allow locking even in intermediate positions.

Rodless cylinders with magnetic sliding

This type of cylinders without stem reduces seal leaks and wear naturally related to the presence of the closing band on which the piston slides. In our MAGNETIC SLIDE SERIES cylinders, the coupling between the pneumatic piston and the slider carriage takes place via a magnetic field and not via a mechanical connection with sliding gaskets, typical of classic rodless cylinders.

Rodless cylinders Series PU

This type of rodless cylinders is made with an internal polyurethane band that guarantees greater pneumatic seal when compared with the standard series. The outer band, with the sole function of protecting the cylinder from foreign bodies, is made of steel. The technology adopted and the rigorous sealing tests guarantee significantly reduced leaks compared to the standard.

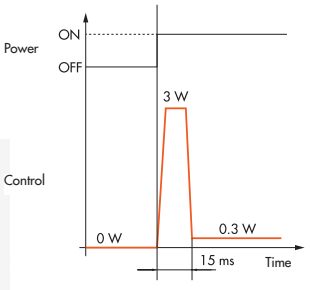


Pneumo power

This component is used to convert the energy of compressed air into electricity by means of a microturbine attached to an electric generator. An interesting application achievable with Pneumo power consists in storing compressed air deriving from the exhausts of the actuators inside a tank and to make it available if necessary through the use of a valve to the Pneumo Power in order to generate electricity in the time of need. This application allows to recover compressed air destined for discharge and therefore to be lost.

Speed up technology

Metal Work uses speed up technology on its pilot valves, which can be sold individually but also included within some of the more technological products such as the EB 80 valve island. This system, through an intelligent control electronics, allows to guarantee a power of 3 W at the start for the first 15 ms of the activation of the electro-pilot while then ensures the reduction of the power to 0.3 W for all the remaining activation time. This has a double advantage: the initial power ensures the correct activation of the electro-pilot while the power reduction allows, among other things, savings in terms of energy.



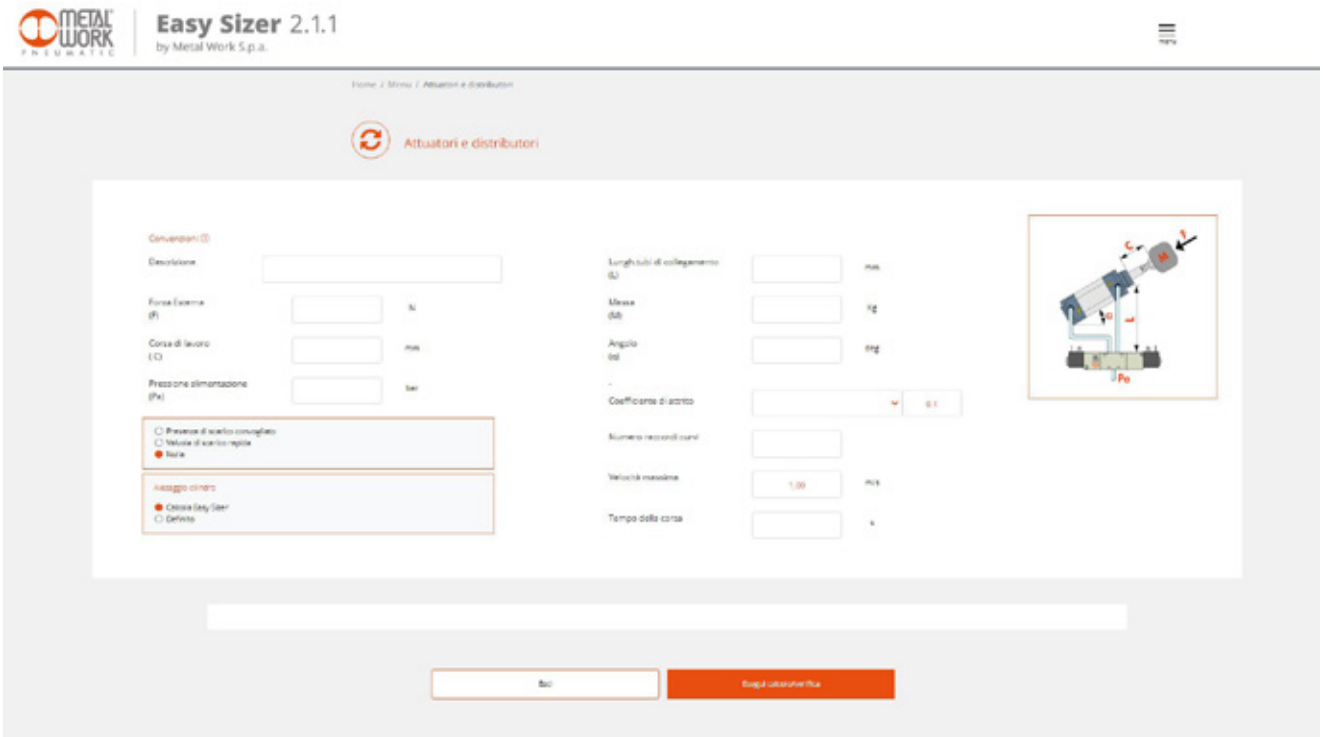
Service

Software for pneumatic components sizing

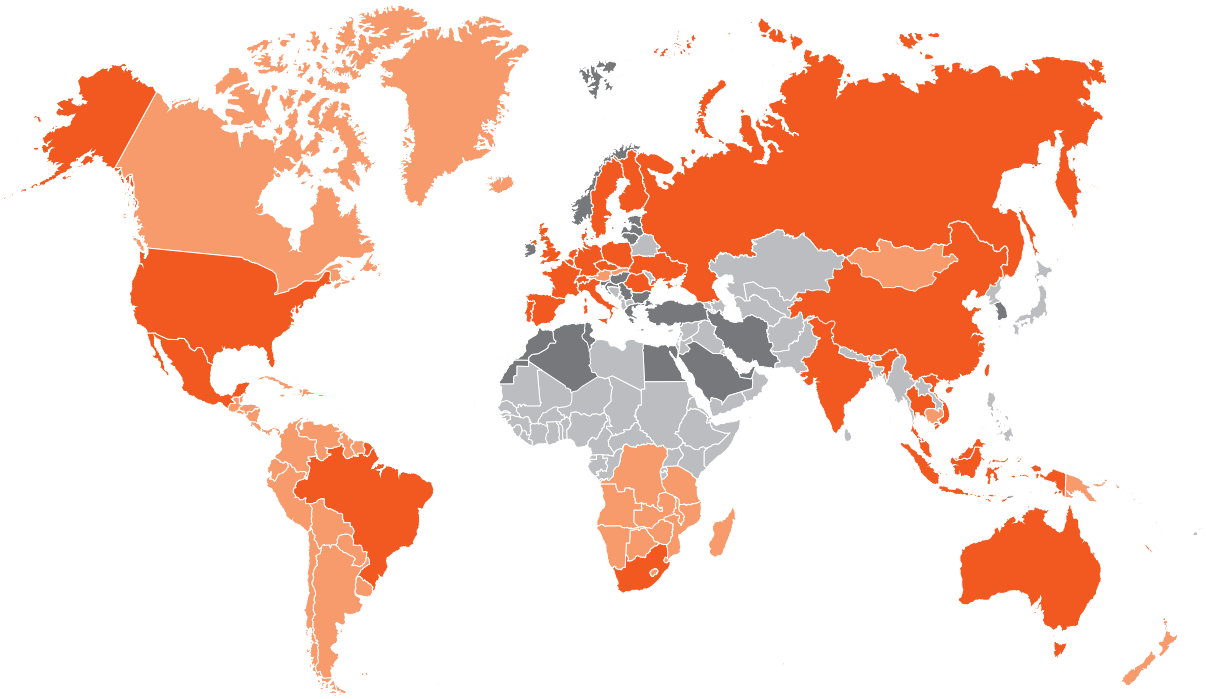
In order to reduce consumption, it is advisable to optimize the sizing of the components of the pneumatic system. In fact, if on one hand the choice of small-sized components can lead to their malfunctioning, on the other hand a choice of excessively large components leads to a decisive and unnecessary consumption of air (as well as an increase in cost for purchase). Pneumatic actuators, and in particular cylinders, consume an amount of air at each stroke that depends on the pressure and the bore. The use of the right cylinder at the right pressure allows considerable savings. In addition, a cylinder that requires a smaller flow rate allows you to combine valve, fittings and tubes of lower size, saving on the cost of products.

In order to facilitate the designer in the choice of the right component, Metal Work offers its Easy Sizer software, downloadable for free from our website, which summarizes years of experience in the production and use of products for pneumatic automation.

The version 2.1.2 of the software "Easy Sizer" sees the implementation of a new environment of the section "Actuators/ Valves" in which it is possible to make an estimate of consumption and CO_2 emissions on an annual basis, for the chosen pneumatic system.



Our sales network.



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