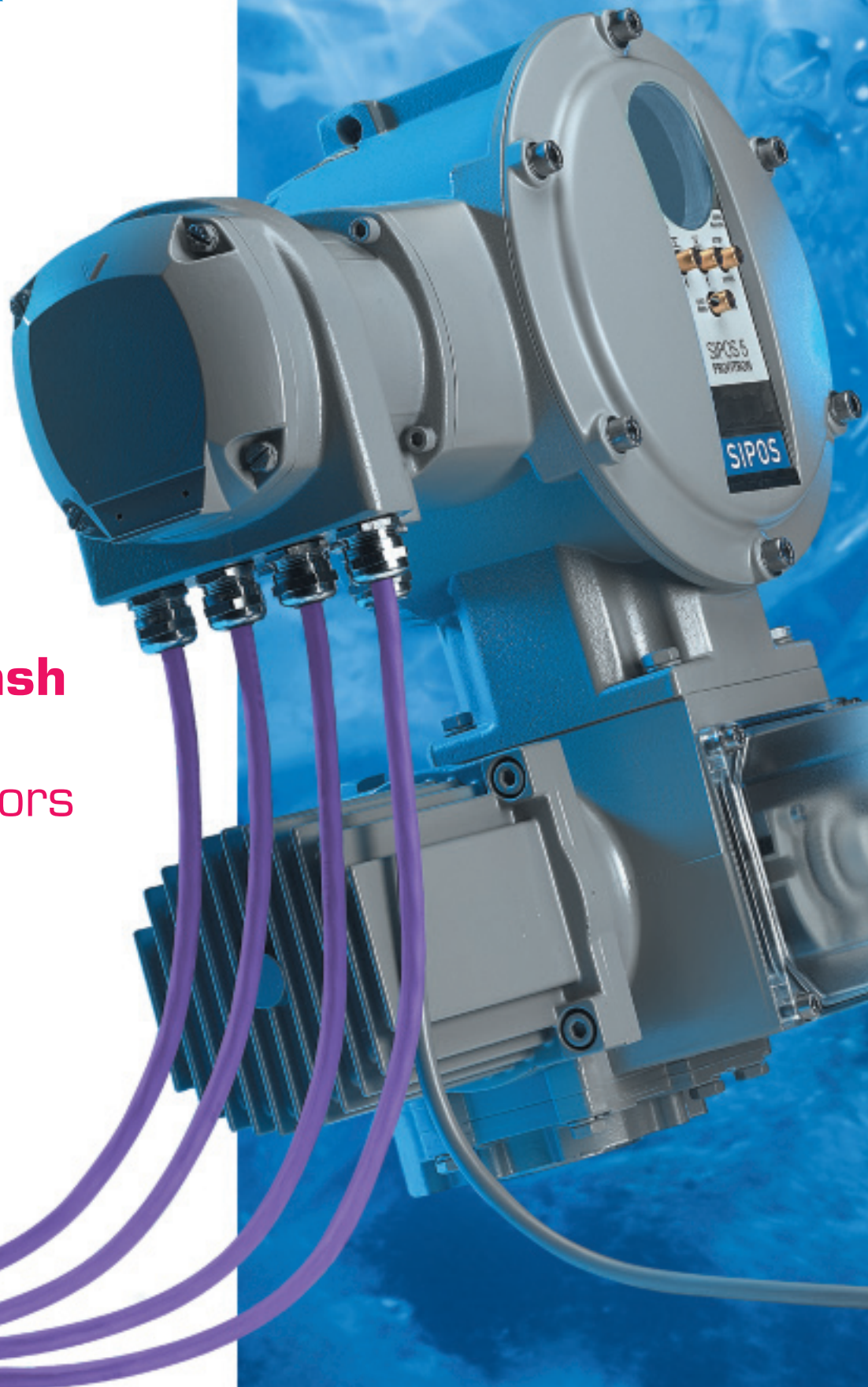


SIPOS
AKTORIK

SIPOS 5 Flash
Electric
Actuators
Technology



Product range

Mechanical interface

Electronics

Details

Commissioning

Control

Functions

SIPOS 5 Flash

Contents

Introduction

Features and benefits at a glance	3
Introduction	4

Product range

Product overview	6
ECOTRON / PROFITRON	8

Mechanical connection

Valve interface	10
Gear unit attachments	11

Electronics

Frequency converter	12
Functional units	14

Details

Overview of actuator design (insert)	16
--	----

Commissioning

Local control station	22
Menu driven display on PROFITRON	23
COM-SIPOS – Operating and parameterization program	24

Control

Control system interface	26
Control modes	27
Fieldbus systems	28
PROFIBUS DP	30
MODBUS RTU	33
SIMA actuator control systems	34
Uninterruptible power supply / solar power	36

Functions

Speed reduction in the end positions	38
Positioner	38
Split-range control	39
Travel-dependent output speed adjustment	39
Process controller	40
Travel-dependent freely adjustable positioning times	41
Valve torque characteristic	41
Analog output speed control	42

SIPOS 5 Flash

Features and benefits at a glance

- **Output torque and speed are independent of the supply voltage / frequency (within a wide tolerance)**

Actuator torque and positioning speed are unaffected by voltage variations of $\pm 15\%$ of the specified voltage range (transitional voltage tolerance $\pm 20\%$) and frequency variations from 40 Hz to 70 Hz.

- **Low starting current – always below nominal rated current**

- Allows lower cable rating / longer cable lengths
- More actuators can be connected to a given cable size
- UPS systems can be specified with a lower power rating

- **Enhanced valve protection**

- The actuator reduces speed before reaching the end position
Valves are moved gently in or out of the end positions at full torque
- Torque tripping without over-torque
The actuator is shut off at the stall torque of the motor

- **Easy positioning speed changes**

Process optimisation can occur post installation

➔ Allows simplification at the planning stage

- **Water hammer / cavitation avoidance**

The travel of the actuator can be divided into ranges: an optimal positioning speed can then be selected for each of these ranges to avoid water hammer and cavitation. In addition, it is also possible to linearise the valve flow characteristics using this variable speed capability

- **Precise control with high repeatability**

Accurate and repeatable valve positioning is achieved through speed reduction when approaching the setpoint

- **Multiple software configured options**

- Many software options are available which can easily be subsequently configured, for example process controller, travel-positioning time curve etc.
- Customer specific functions can be implemented at short notice

- **DCS / PLC interface is fully flexible**

Binary and analog signaling are always available, even when utilizing the fieldbus interface
The fieldbus interface is easily retrofitted

- **Single or three-phase power supply**

Use of a frequency converter in combination with a robust three-phase asynchronous motor allows connection to single or three phase power supplies

- **Full motor protection**

Measuring and monitoring of both motor current and temperature provides full motor protection

- **Reduced spares inventory for the complete actuator range**

Converter technology and actuator software allows the number of mechanical and electrical components to be reduced to a minimum

SIPOS 5 Flash

Setting new generation actuator standards



Over a number of years there has been an increasing trend in process automation to distribute control system functionality away from central control to actual field devices close to point of application. SIPOS 5 Flash actuators are setting the standard in pioneering product development that supports this change.

Wide ranging actuator applications

The SIPOS 5 Flash actuator series has proven field reliability and constant further development has opened up a wide variety of applications including:

- The **energy sector** – from the power plant to district heating
- **Water management** – from drinking water processing to the sewage treatment plants
- **Industrial plants** – from cement factories to the food and chemical industries

[Product range](#)[Mechanical interface](#)[Electronics](#)[Details](#)[Commissioning](#)[Control](#)[Functions](#)

Integrating power and control circuits within the actuator, means components traditionally mounted in separate control cabinets such as circuit breakers, reversing contactors and thyristors have been designed out, thus resulting in lower system costs, simplified installation and increased reliability.

Flexible electronics also enables the actuators to be used with both conventional and fieldbus systems – the SIPOS 5 Flash is extremely adaptable to the respective control system. The modular structure of the SIPOS 5 Flash allows it to be upgraded from simple conventional control to fieldbus communication to suit a wide variety of applications.

The modularity of the unit means that the electronics can be quickly and easily mounted separately from the gear unit. This has benefits where extreme vibrations or ambient temperatures are experienced, if there are space constraints or when local operator control is not possible.

The SIPOS 5 actuator promises valve manufacturers, consultants, plant constructors and operators supreme flexibility and functionality both now and in the future.

The full capabilities of the innovative new generation SIPOS 5 Flash actuators are detailed on the following pages.

SIPOS 5 Flash

One for all - *The intelligent approach to actuator design*

Modern process engineering requires valves which will operate at precisely defined speeds.

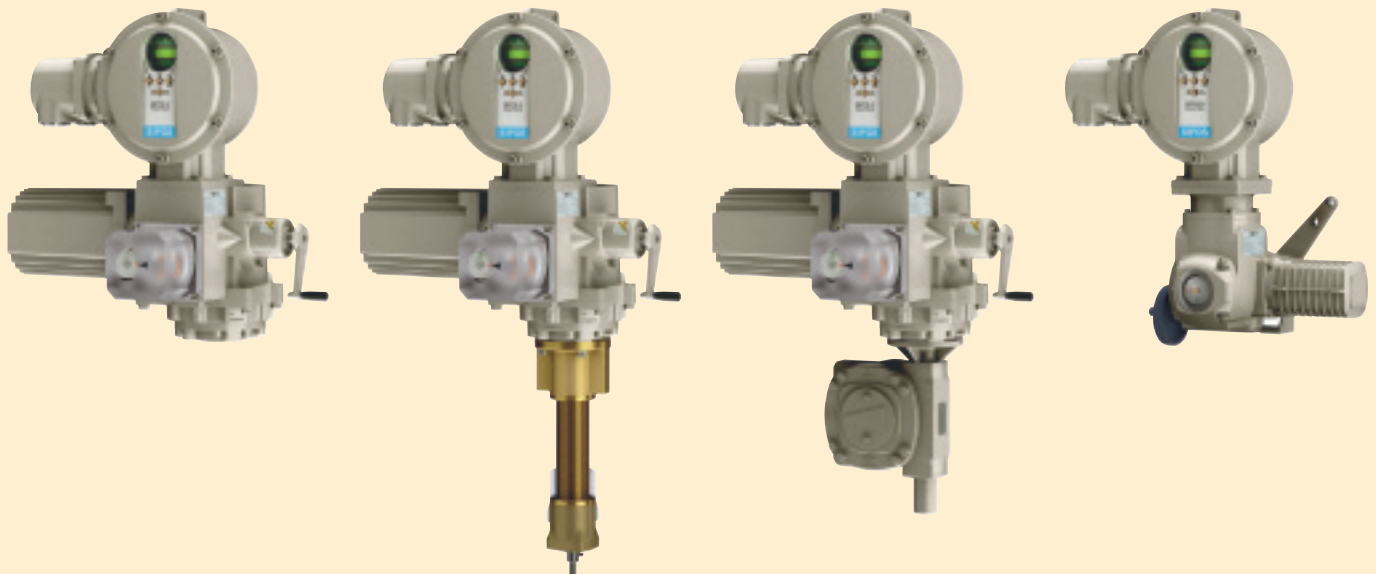
The SIPOS 5 Flash actuator range incorporates an electronic frequency converter driving a robust induction motor (instead of the conventional motor plus reduction gear arrangement) which allows software configurable speed control (ratio 1:8) for valve open/closure rates. Changing speeds rates is therefore an extremely simple procedure either at time of valve specification or later on-site.

This intelligent approach to actuator design provides the ultimate in actuator flexibility which has benefits in plant design, construction, startup and commissioning. There are even benefits in supply chain inventory as the same actuator can cover a multitude of requirements.

Electronics replaces mechanical components

Replacement of mechanical components such as limit and torque switches reduces the need for maintenance ensuring trouble free operation.

Time consuming adjustment work is a thing of the past as the SIPOS 5 Flash PROFITRON does not even have to be opened for recommissioning.



Rotary actuator 2SA5 ...

Performs as both a stand alone rotary actuator and the key component of the linear and part turn actuator variants 2SB5 and 2SC5

Linear actuator 2SB5 ...

Consists of a rotary actuator 2SA5 and an attached thrust unit

Software configurable positioning speed (mm/min) and cut-off force (kN)

Part-turn actuator 2SC5 ...

Consists of a rotary actuator 2SA5 and an attached worm gearbox

Software configurable positioning time (sec/90°) and cut-off torque (Nm)

Small part-turn actuator 2SG5 ...

Consists of a compact part-turn unit with attached electronics.

Software configurable positioning time (sec/90°) and cut-off torque (Nm)

Product range

Mechanical interface

Electronics

Details

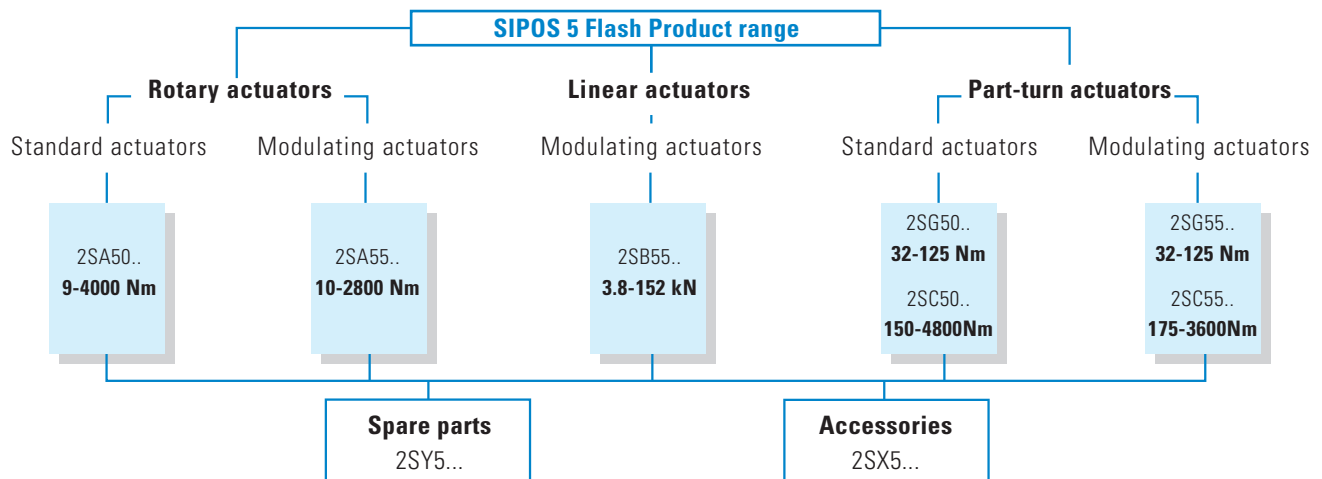
Commissioning

Control

Functions

Actuators for every application

Whatever the industrial processing application, both standard and modulating duty, the SIPOS 5 Flash actuator range provides a solution.



For applications where torques exceed the standard range specification, combinations of 2SA5 rotary actuators and larger gear units provide the necessary solution.

Other products of SIPOS Aktorik

- 2SA58..-

Rotary actuators for continuous modulation

HiMod, 10-2800 Nm

- 2SM2...-

Actuator control systems

SIMA

- M76348-

Double motor actuators

for modulating duty 750-3000 Nm

- M76361-/M76371-

for On-Off duty

- M76362-/M76272-

for modulating duty

Rotary actuators for nuclear applications to KTA 3504

In order to simplify the specification, ordering, installation and maintenance of our products, a complete information package consisting of ordering data, spare parts lists, technical data, instruction manuals, certificates and the complete catalogue is available.



Use our CD or the internet at www.sipos.de for detailed product selection.

See our website www.sipos.de, where you will find product selection and application documentation (also dimensional drawings in dxf-format), updates for our PC program COM-SIPOS and the latest version of our firmware.

Should you require any further support, full contact details of your local sales and service centre are available on the website or contact us directly at:

SIPOS Aktorik GmbH

Electric actuators

Im Erlet 2

D-90518 Altdorf, Germany

Phone +49 9187 9227-0

Fax +49 9187 9227-5111

info@sipos.de

SIPOS
AKTORIK

Control and regulation - Suitable for every process

SIPOS 5 Flash actuators are available both as standard and modulating actuators.

The standard actuators are designed for S2 duty cycles (short-time duty) 15 min, the modulating actuators are designed for S4/S5 intermittent operation with a minimum of 25 % relative duty to a maximum of 1200 cycles per hour in accordance with DIN EN 60034.

Two electronics variants

SIPOS 5 Flash actuators can be supplied with two different electronic versions: ECOTRON and PROFITRON.

Common features

- Integrated frequency converter
- Electronically adjustable speed
- Electronic limitation of torque/cut-off force
- Extensive internal monitoring functions, including full motor protection
- Simple commissioning with user guidance
- Integrated power and control electronics
- No external switching devices, reversing controllers or control cabinets required
- Universal interface for both conventional controls and fieldbus automation systems
- Built-in local control station

ECOTRON version

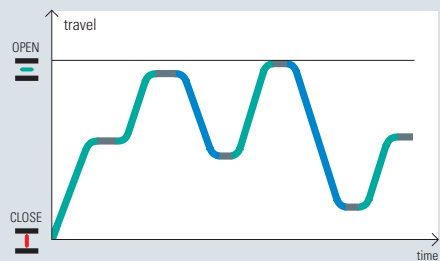
Especially suitable for standard actuators and simple modulating control functions with control via OPEN, CLOSE and STOP commands. Position signaling to the control system via 5 signal outputs. An analog 4-20 mA feedback signal is available as an option.

PROFITRON version

Ideally suited to the high-tech modulating actuator applications, but also applicable to more standard installations. In addition to control by means of switching commands, the PROFITRON has an input for emergency operation and an optional 0/4-20 mA input for the integrated positioner. Position signaling to the control system is provided by 8 signal outputs and a 0/4-20 mA feedback signal. With plain-text display the PROFITRON electronics can be used to monitor, diagnose and, if necessary, enable actuator configuration. The language of the display can be selected as required.

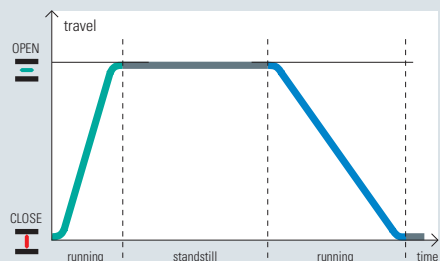
ECOTRON

The same output speed for OPEN and CLOSE direction – can be selected and set from 7 available speeds.

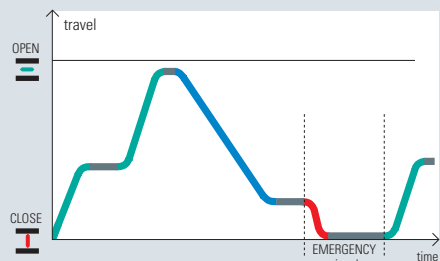


PROFITRON

Different output speeds for OPEN and CLOSE direction – can be selected and programmed from 7 available speeds.



In addition to the different output speeds for OPEN and CLOSE direction, further output speeds can be defined and programmed for OPEN and CLOSE direction for EMERGENCY operation.



- in OPEN direction
- in CLOSE direction
- standstill
- running to EMERGENCY position

Product range

Mechanical interface

Electronics

Details

Commissioning

Control

Functions

SIPOS 5 Flash



ECOTRON



PROFITRON

Inputs and outputs

Control inputs OPEN, CLOSE, STOP (electrically isolated)	●	●
Control input EMERGENCY (electrically isolated)		●
24V external power supply possible	●	●
Setpoint 0/4...20 mA (optional electrically isolated)		○
Open-circuit detection	●	●
Pulse/permanent contact control	●	●
Control via threshold switch		●
Two-wire control		●
Control mode REMOTE switchable		●
Signaling outputs 24 V (electrically isolated)	5 ●	8 ●
Relay outputs (each NC, NO)	5 ○	5 ○
Position feedback signal 0/4...20 mA (optional electrically isolated)	●	●

Fieldbus interface

PROFIBUS DP 1-channel (optional with fiber-optics) or 2 channels	○	○
MODBUS RTU 1-channel (optional with fiber-optics) or 2 channels	○	○

Communication with parameterization tools

DTM for FDT	●	●
EDD for PDM	●	●
COM-SIPOS	●	●

Adjustment / parameterization possibilities

Tripping torque OPEN/CLOSE	●	●
Output speed steps	7 ●	7 ●
Independently adjustable output speeds for OPEN, CLOSE, EMERGENCY OPEN/CLOSE	1 ●	4 ●
Cut-off mode (travel / torque dependent)	●	●
Direction of rotation	●	●
Retry when blocked in move		●
Intermediate contacts		2 ●
Motor protection bypass		●
Motor heater	○	●
Maintenance intervals		●

Software functions

Positioner (adaptive three-point controller)		○
Proportional / split-range function		○
Process controller		○
Travel-speed characteristic curve		○
Analog output speed setpoint		○
Travel-dependent freely adjustable positioning times		○

Miscellaneous

Local control station (lockable with padlock/protective cap)	●	●
Multilingual display		●
LED display REMOTE / LOCAL	●	●
LED display OPEN / CLOSE / running indication	●	●
Soft start-up	●	●
Valve torque reference curve recording (3 reference curves)		●
Diagnostic data	●	●
Motor temperature monitoring	●	●
Automatic phase sequence correction	●	●

● Standard

○ Option

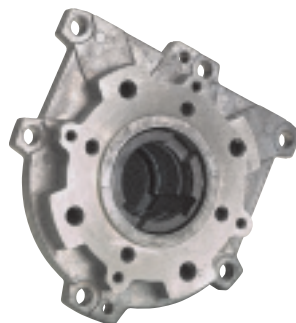
● Standard for modulating

SIPOS 5 Flash - Mechanical interfaces for all valve types

Various forms of mechanical interfaces are available which can be used to connect the actuator to different control elements (valves, butterfly valves, gate valves, ball valves). Rotary actuators can be supplied with flange connections and couplings in accordance with DIN ISO 5210 and DIN 3338 or DIN 3210 with output shaft forms A, B1, B2, B3, B4 and C or A, B, C, D and E, depending on the customer's wishes.

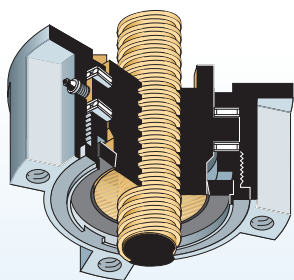
Linear actuators are mechanically connected in accordance with DIN 3358 and part-turn actuators in accordance with DIN ISO 5211.

Depending on the type of valve, type-dependent flange reductions can be supplied for the rotary actuators.



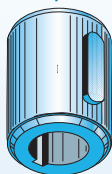
The output shaft for rotary actuators is designed as hollow B1-/B shaft.

The torque is transmitted to the valve via a featherkey. Other output shaft forms are achieved by means of inserts or extension modules.



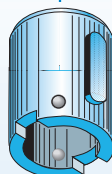
A output shaft

Threaded bush for rising, non-rotating valve stems. The rotary movement of the actuator is converted into linear movement of the stem by means of a threaded bush (stem nut). This type of shaft can be supplied with a trapezoidal thread to DIN 103. The connecting flange with threaded bush and axial bearings is a unit which is suitable for absorbing thrust



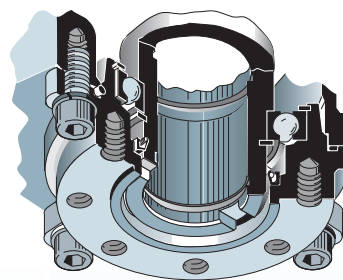
B2, B3, B4 and E output shafts

An insert with bore and featherkey is inserted into the hollow B1/B shaft. As with the hollow B1/B shaft, the torque is transmitted to the valve by means of a featherkey



C output shaft

A claw coupling insert which is inserted into the hollow B1/B shaft. The torque is transmitted to the valve by means of the claws



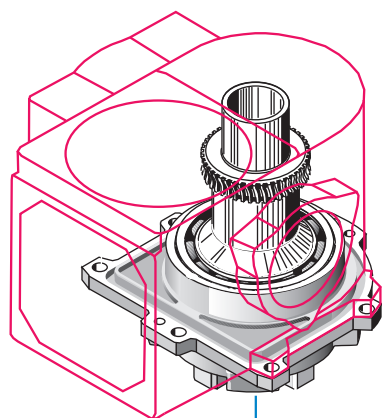
D output shaft

A free shaft end which is inserted into the hollow B1/B shaft and has a featherkey. The torque is transmitted to the valve by means of the featherkey

The A output shaft is also available in a spring-loaded design (**AF output shaft**).

The output shaft forms A, B1 and C or A, B, C (if in accordance with DIN 3210) are suitable as hollow shafts for rising spindles. Spindle protection tubes can be supplied in different lengths.

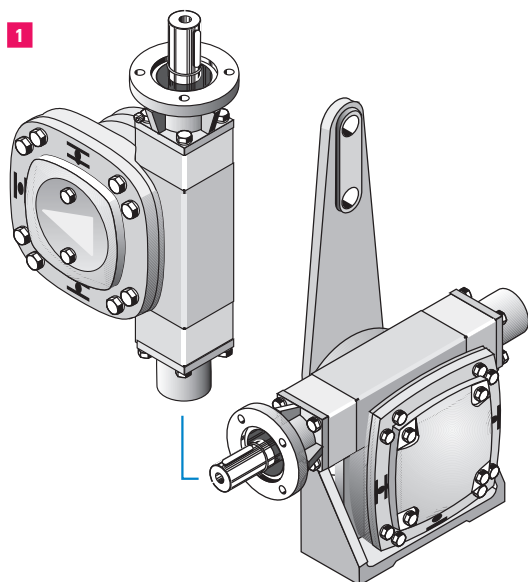
Large torque capability



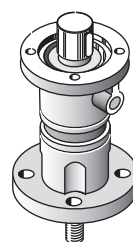
Large torque ranges for rotary movements, linear actuators and part-turn actuators are created by fitting precisely matched mechanical components to the rotary actuators.

These components continue the concept of modularity seen with the electronics units through the mechanical design of the actuator, thus keeping spare part inventory to a minimum. There are three completely interchangeable gearbox options which are described below:

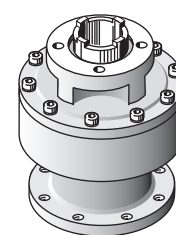
1



2



3



1 Worm gearbox for direct mounting and worm gearbox with base and lever

2SC5... part-turn actuator

Part-turn actuators are used where operation of a final control element requires a 90° or larger part-turn movement. Usually the part-turn actuator is built onto the valve. The connection to the valve shaft is achieved by means of a coupling (bore with keyway, square bore or bore with two-flats) with a splined shaft connection.

If direct mounting is not possible due to a lack of space or the design, the movement is transmitted by means of a rod. In these cases a version with a base and lever is available and the appropriate ball joints can be supplied. The worm gear unit converts the rotary movement of the rotary actuator into a part-turn movement. In this way the rotary actuator becomes a part-turn actuator.

2 Linear thrust unit

2SB5... linear actuator

The rotary movement of the rotary actuator is converted into a linear movement by means of the linear thrust unit. The rotary actuator thus becomes a linear actuator and the torque becomes an axial force. Different stroke lengths can be supplied.

3 Planetary gear

2SA5... rotary actuator

The planetary gear has a reduction of 4:1 and therefore achieves four times the torque with reduced output speed. Actuator torque range availability is detailed below:
Standard actuators - 600-2000 Nm and 1200-4000 Nm
Modulating actuators - 700-1400 Nm and 1400-2800 Nm

The actuator electronics take account of the different add-on modules specified and consequently different physical parameters are used by the software. For example in the case of a linear actuator (rotary actuator + thrust unit), the positioning speed [mm/min] and the cut-off force [kN] are used. If a rotary actuator were specified as the basic device, then the output speed [rpm] and the cut-off torque [Nm] are used.

Flexible control by means of a frequency converter

Using a frequency converter in the actuator allows complete control of the motor i.e.: speed and direction of rotation together with torque. The voltage applied to the motor by the frequency converter determines the output torque, whilst the frequency determines the output speed.

A number of benefits offered by this unique combination of frequency converter and controller specially designed for service in electrical actuators includes:

– Voltage variation compensation

Actuator designed for “80 % nominal voltage”, valve design for torque at “110 % nominal voltage”? You won’t need to worry about this any longer – the motor voltage is regulated independently of the input voltage.

– Valve protection

The SIPOS 5 Flash moves to its end position at a fixed low speed, therefore over-torque is avoided due to the low kinetic energy of motor and gears.

– High torque when it matters

Moderate blockages pose no problem for the SIPOS 5 Flash. By running at low speed with high torque, the actuator is able to overcome valve blockage without risk of valve damage.

– Planning flexibility

Sometimes during the planning stage, it is good to have a little free play in terms of output speed and torque - some things look different on site. A speed ratio of 1:8 offers many possibilities for process optimization at a later stage.

– Optimum position control

The positioner integrated in the SIPOS 5 Flash PROFITRON utilizes the different speed control capability of the frequency converter: this means that large position changes result in high speed correction, whereas small deviations are adjusted more slowly.

– Reduced spare-parts stock

The ability to ‘soft’ configure speed and cut-off torque means that the whole actuator range can be covered by a small number of variants. This simplifies stock keeping of spare actuators and components.

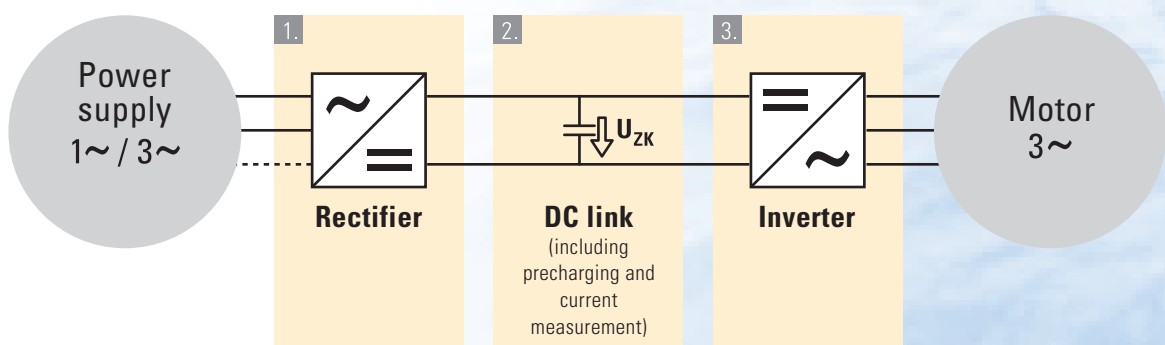
– Motor start-up current control

The use of the frequency controller ensures that there is no „starting current” effect. The power supply only has to be designed for the nominal current at the rated running torque. This allows smaller cable cross-sections and smaller power reserves to be specified, thus saving money.

– Automatic monitoring and adjustment

The frequency converter performs a number of additional important tasks:

- Continuous current monitoring protects the motor and thus dispenses with the need for separate motor protection
- Continuous torque monitoring
- Automatic phase correction – the integrated rectifier works independently of the supply phase sequence
- Voltage measurement – over-voltage and under-voltage can reliably be detected and reported
- Temperature compensation – thermally sensitive voltage control automatically compensates for the temperature dependent motor torque



Schematic of a frequency converter

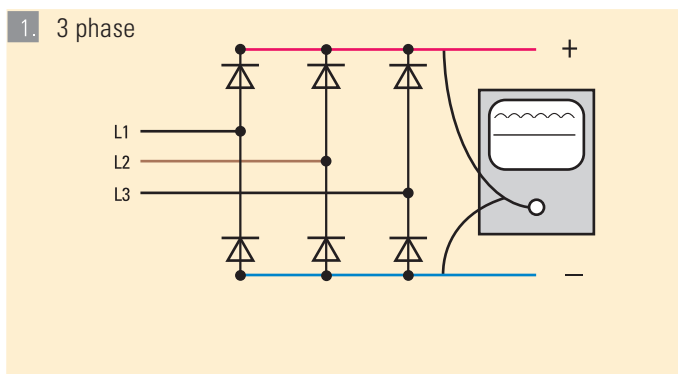
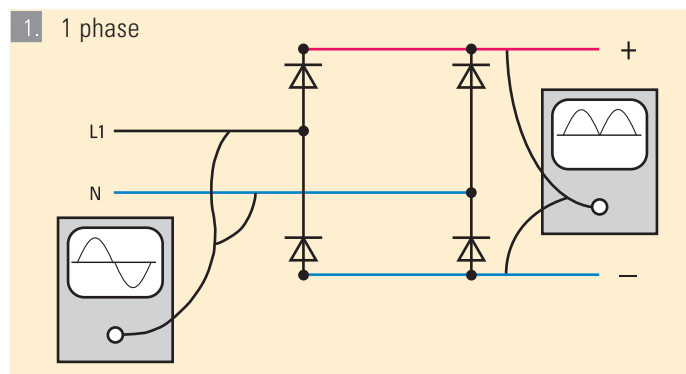
The frequency converter – How it works

Frequency converters with a DC voltage link are now standard devices employed by a wide range of industry users. The frequency converter generates a three-phase voltage of variable frequency and amplitude from a single-phase or three-phase voltage with a fixed frequency (e.g. 50 Hz) and amplitude (e.g. 400 V).

The following is a brief description of how these devices function:

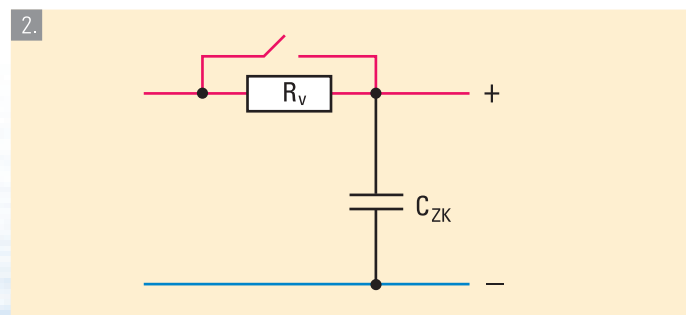
1. Rectification

The single-phase or three-phase alternating voltage is rectified by means of a diode bridge:



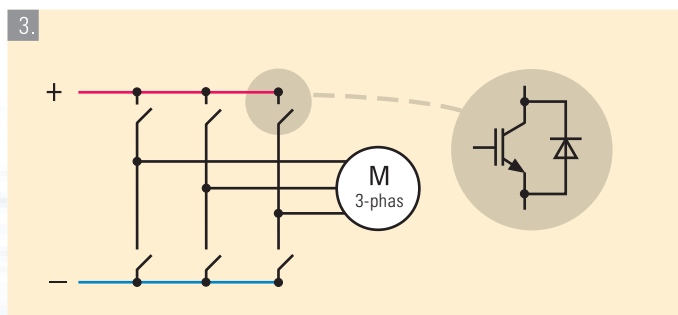
2. Precharging and smoothing

The voltage is smoothed in the so-called „DC link“ by large capacitors. To ensure that a voltage surge is not immediately transferred to the capacitors when the mains voltage is switched on, precharging resistors are connected in series. During operation, these resistors are bridged by a relay.



3. Pulse-width modulation

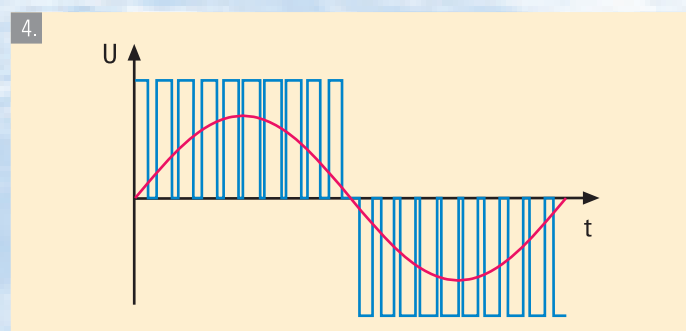
The DC voltage now in the DC link is converted into a three-phase voltage of variable frequency and amplitude. In the three motor leads, there are fast-acting electronic switches for this purpose, so-called IGBTs (isolated gate bipolar transistors).



4. Ongoing control

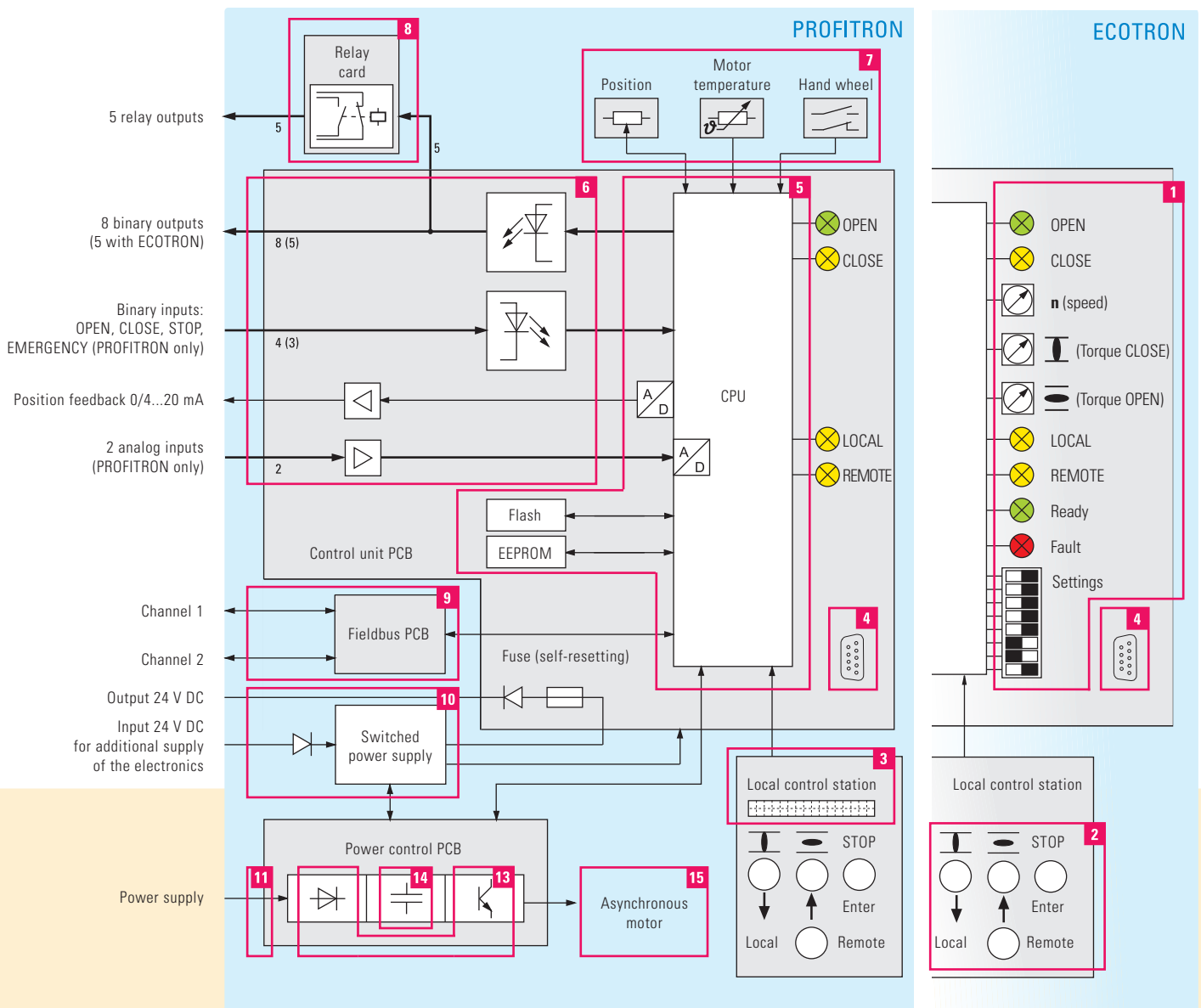
The switches connect each motor phase either to the POSITIVE or to the NEGATIVE rail. The power-on duration and the polarity of the voltage can be very finely adjusted so that the desired sinusoidal voltage is produced as a fundamental of this chopped or „pulse-width-modulated“ DC voltage. The motor's inductance acts as a quasi filter.

A very fast computer – the microcontroller – and application specific integrated circuits are necessary for ongoing calculations of the correct power-on switch point in the three motor phases (each of the six IGBTs is switched on and off up to 16 000 times per second!).



Electronics

Intelligence in the actuator -
and everything works fluently



SIPOS 5 Flash ECOTRON

is designed for all standard tasks i.e. for standard actuators and simple modulating applications.

SIPOS 5 Flash PROFITRON

has been specially developed for the highest requirements for closed-loop and open-loop control.

The microcontroller (central processing unit - CPU)

performs all the control functions for the SIPOS 5 Flash. These include:

- Frequency converter control
- Motor temperature monitoring
- Actuator position monitoring

Either by means of a precision potentiometer or through contactless position recording using a magnetic angular sensor (option)

- Torque control
- Control system signal evaluation

The switched power supply

supplies the internal loads and also provides an output voltage of 24 V DC for supplying external switches for the commands OPEN, CLOSE and STOP. Alternatively a separate 24 V external power supply to the electronics enables communication even if the mains supply is switched off.

Product range

Mechanical interface

Electronics

Details

Commissioning

Control

Functions

Control PCB ECOTRON

1
Parameterize/
observe

Firmware load

2
Operation for end
position adjustment

Control PCB PROFITRON

3
Parameterize/
observe

4
PC interface

6
Control system
interface

5
Central processing unit

7
Gearbox interface

8 Relay card

9 Fieldbus PCB

Power control PCB

10
Switched power supply

12
RFI filter

11
Power supply

16
Driver for
power module

13
Power module (IGBT)

15
Motor connection

14
Precharging

14
DC link

The most important advantages

- Integrated control electronics
- Differentiated control electronics
 - SIPOS 5 Flash ECOTRON for all standard applications
 - SIPOS 5 Flash PROFITRON for higher specification requirements
- Fieldbus interface or relay card optional – also for SIPOS 5 Flash ECOTRON
- Microcontroller for precise motor control, communication and actuator monitoring
- Separate 24 V DC supply possible for electronics
- Actuator parameters stored in EEPROM (nonvolatile)
- Full RFI safety
- Data storage without battery or storage cell

New technology in the SIPOS 5 Flash

Down to the smallest detail -

Electronics instead of mechanical components

SIPOS 5 Flash actuators are extremely robust: they have a proven track record of reliability wherever they are installed, even under the most severe ambient conditions. All actuators in the range have a minimum of IP 67 environmental protection rating to DIN EN 60529. (Note IP68 is also available as an option).

Operator cover and signaling gear cover

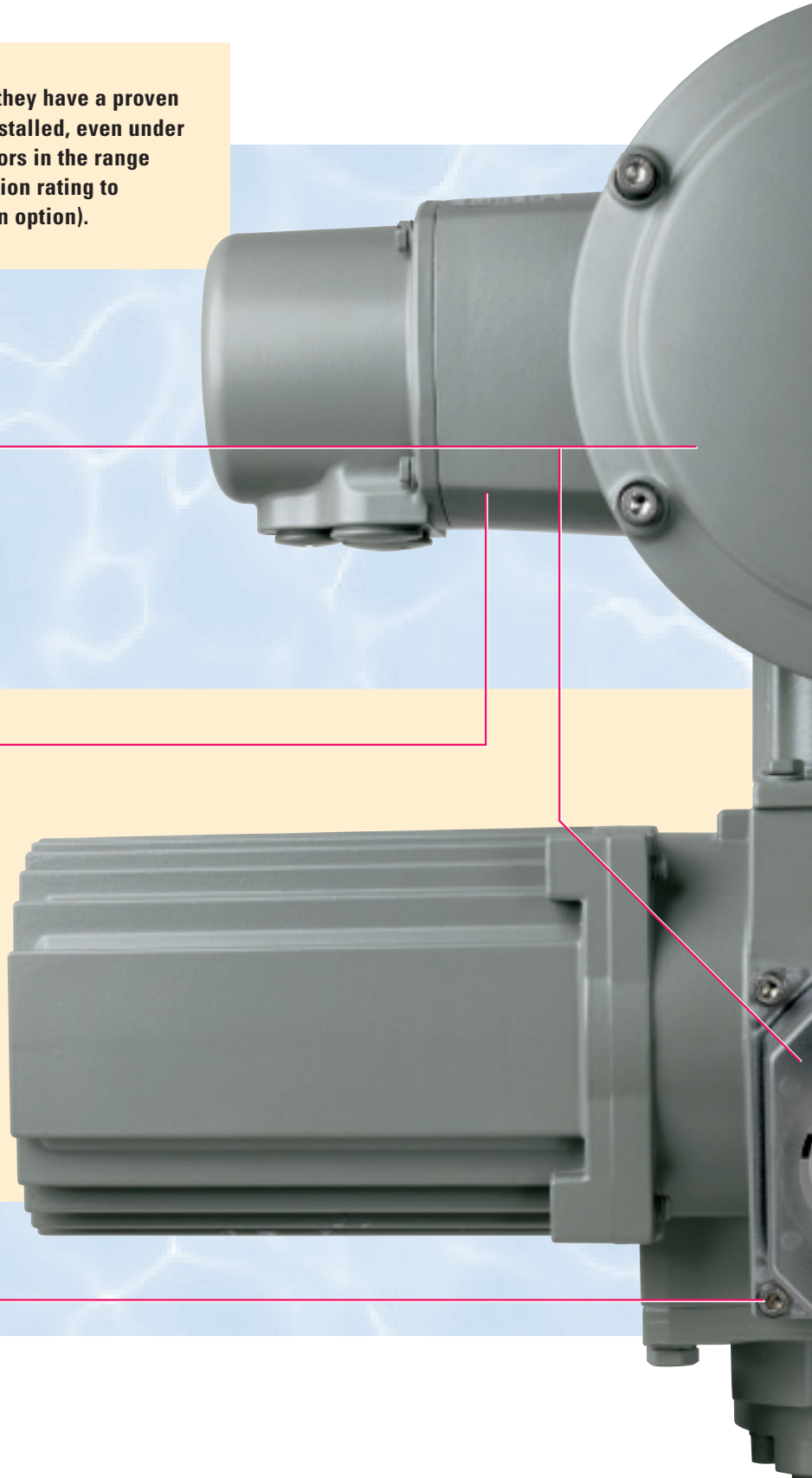
made of highly resistant polycarbonate
(metal option available).

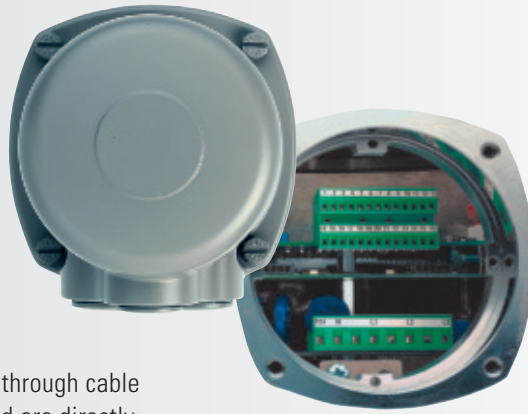
The housing material

consists of a special, extremely corrosion resistant aluminum alloy. This material is characterized by its high strength and low weight compared to ductile cast iron, the conventional actuator casing material. Under normal atmospheric conditions the SIPOS 5 Flash can be used outdoors without paint protection. For harsher environmental conditions, e.g. for operation in cooling towers, the actuator is available with alternative paint coatings including heavy-duty anti-corrosion paint.

Stainless steel screws

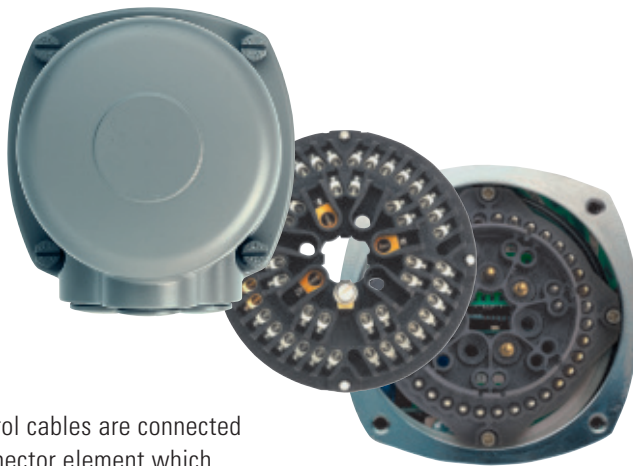
For long term corrosion free service, all fasteners are manufactured from Stainless steel.





Direct connection

Connecting cables are led through cable glands into the housing and are directly connected using PCB plug-in terminals.



Round plug

Motor and control cables are connected by a 50-pin connector element which uses screw-type terminals to ensure reliable electrical contact. If the connection has to be un-plugged for maintenance work, the wiring of the control unit is always retained.



Fieldbus connection

Simple connection of the fieldbus cables to the separately accessible bus termination PCB.

The mains and control cables are connected in the same way as the round plug.

ECOTRON control PCB



PROFITRON control PCB

Asynchronous motors

Motive force in the SIPOS 5 Flash is provided by an asynchronous motor. The straightforward design provides unrivalled reliability, robustness and operational safety. Force is transmitted directly to the worm shaft without intermediate gears.

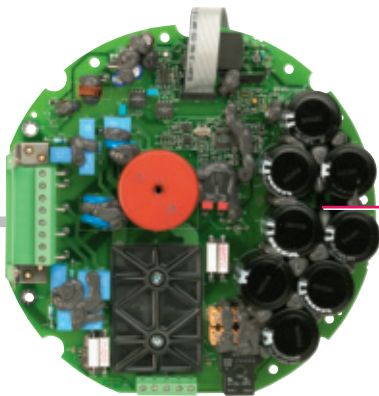
SIPOS 5 Flash

Simple modular design

Relay card



Power control PCB



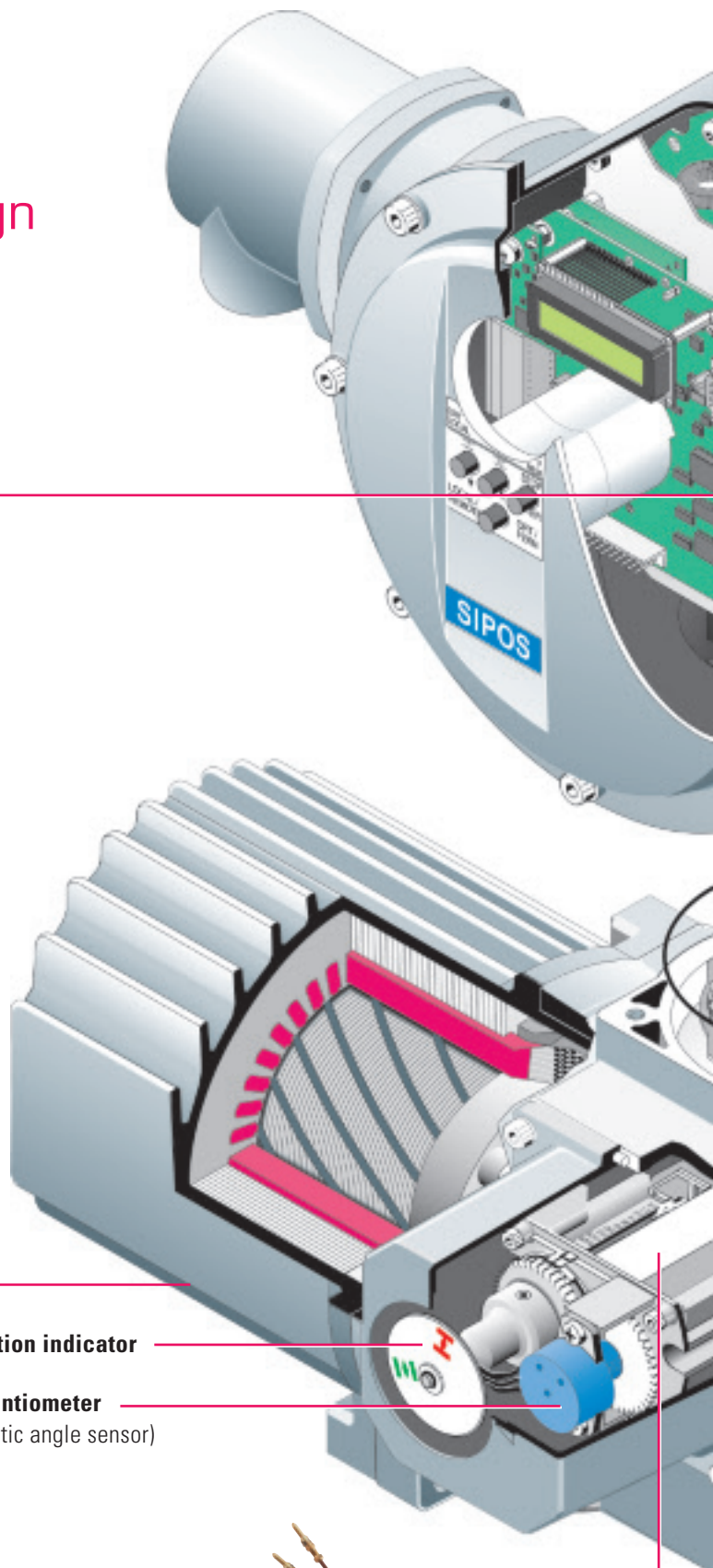
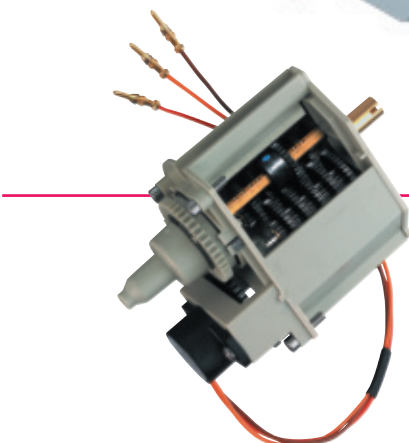
Fieldbus PCB
1 or 2 channel

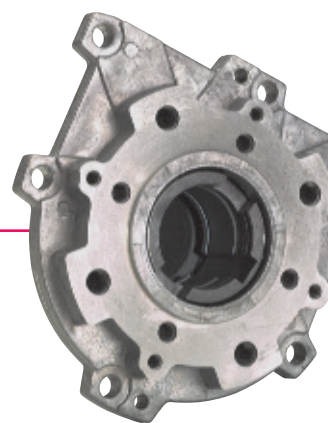
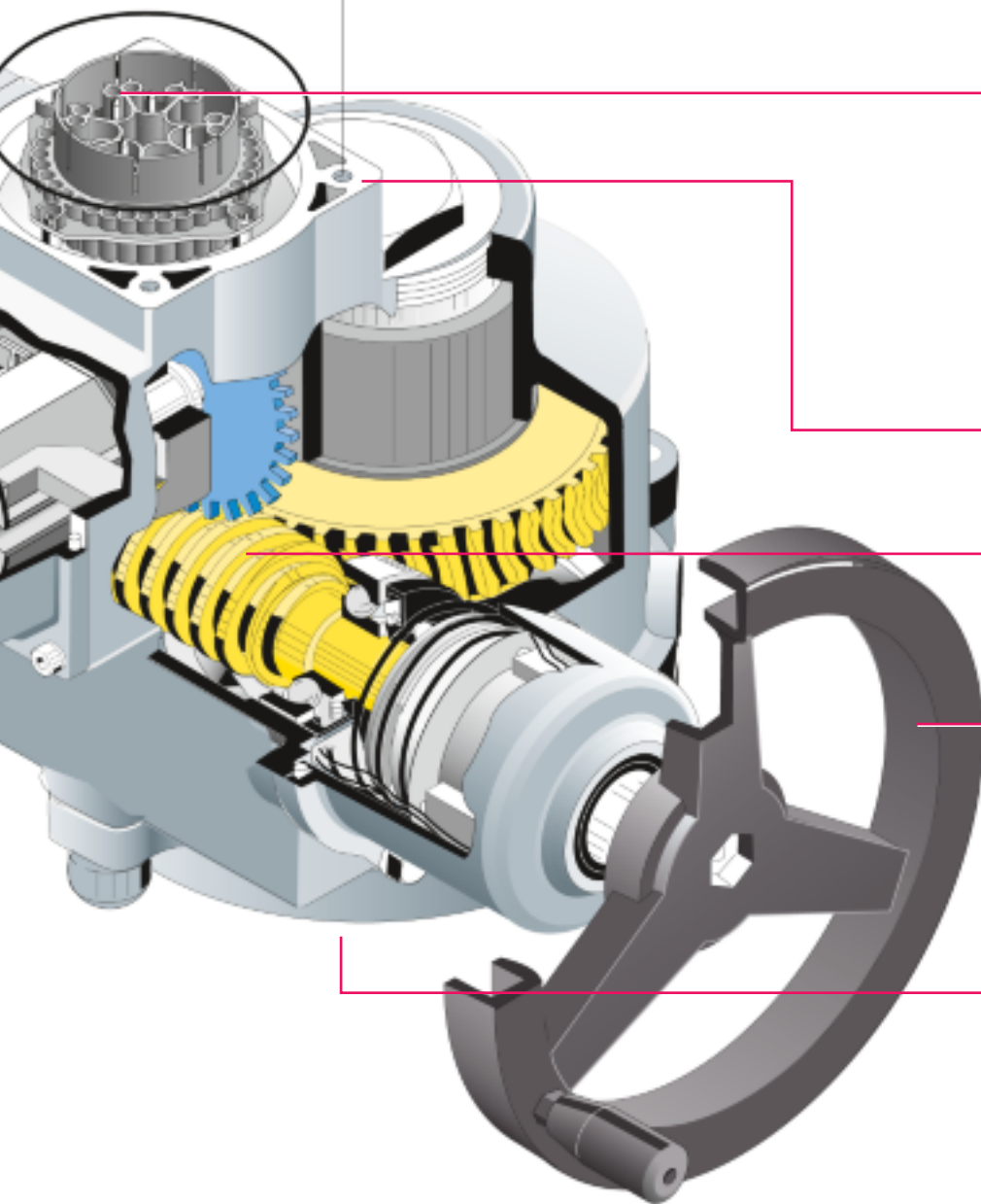
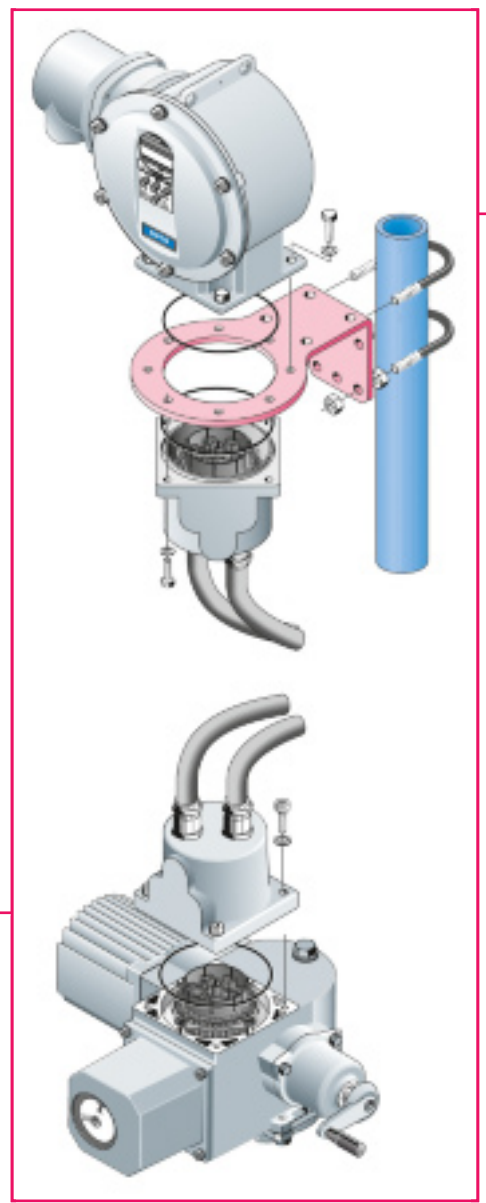
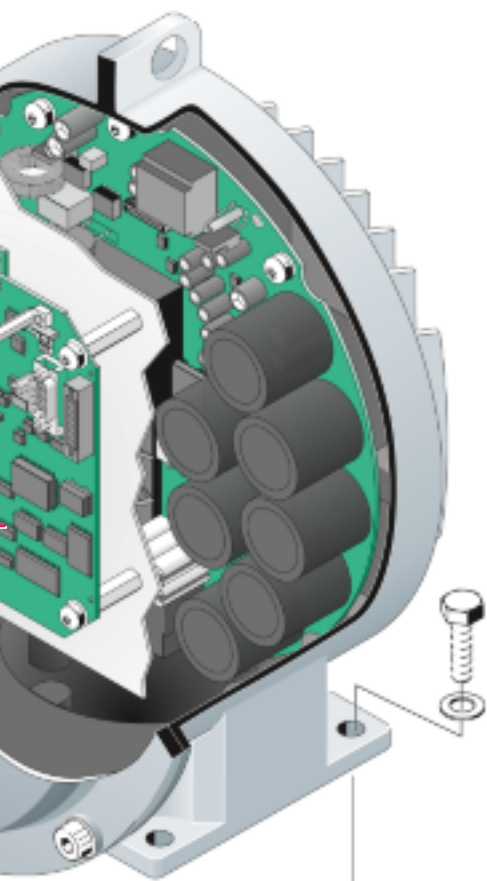
Mechanical position indicator

Precision potentiometer
(optional magnetic angle sensor)

Signaling gear

A precision potentiometer, or magnetic angle sensor for contact-less position detection (optional), is operated by means of the signaling gear to detect the current position of the valve. The signaling gear reduces the rotary movement of the output shaft to less than 300° for full stroke i.e. OPEN to CLOSE, and can be set to between 0.8 and 4020 revolutions per stroke without any tools.





Product range

Mechanical interface

Electronics

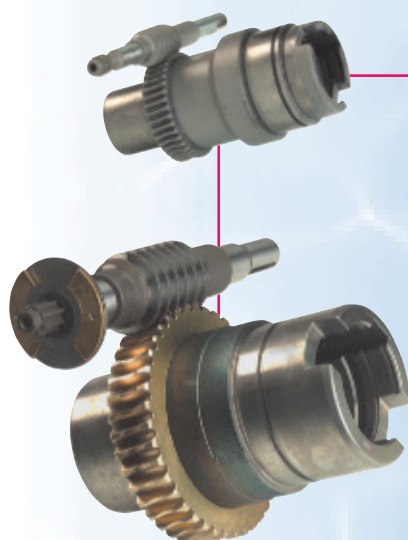
Details

Commissioning

Control

Functions

Spindle protection tube

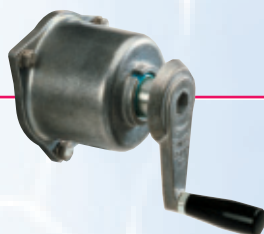
**Worm and output shafts**

Small and medium-sized actuators use a combination of steel and ductile cast iron, whereas steel and bronze are the chosen materials for large actuators.

The drive from the motor to the worm wheel of the output shaft via the worm shaft is self-locking in the case of all modulating actuators and most standard actuators.

The gear unit uses long-life gear oil for enhanced service intervals.

The worm wheel and output drive provide high efficiency, maintenance free operation.

**Hand crank or hand wheel**

For manual operation the hand wheel is pressed towards the actuator and operates directly on the worm shaft. To ensure operator safety, a switch isolates the motor before the worm shaft is engaged. Self-locking of the actuator is retained in the case of manual operation. Large actuators include a centrifugal lock to prevent the hand wheel from engaging before the motor has come to a standstill.

Flange and output shaft

Product range

Mechanical interface

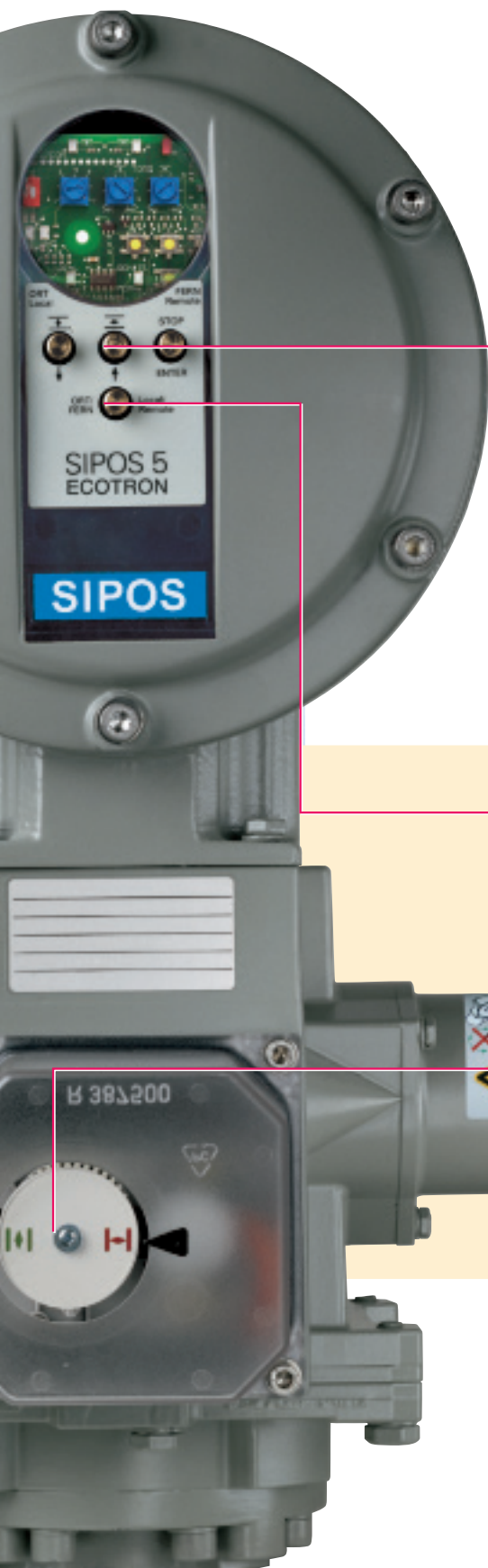
Electronics

Details

Commissioning

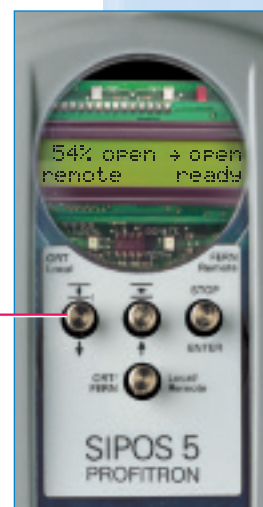
Control

Functions



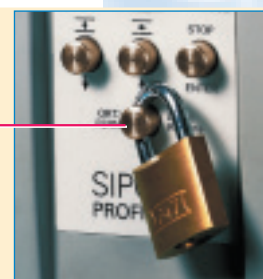
Local control of the actuator using the OPEN, CLOSE and STOP buttons

The SIPOS 5 Flash ECOTRON is set and commissioned by means of DIP switches and potentiometers. LEDs indicate the operational status; flashing patterns signal faults and facilitate diagnosis. Pushbuttons on the SIPOS 5 Flash PROFITRON are also used for on site configuring and retrieving actuator information.



Changeover button LOCAL/REMOTE

Protection against unauthorized operation or change-over to local operation can be prevented with a padlock or cover (optional).



Inspection window

The mechanical position indicator is visible through the cover of the signaling gear. Symbols for OPEN and CLOSE indicate the valve position.



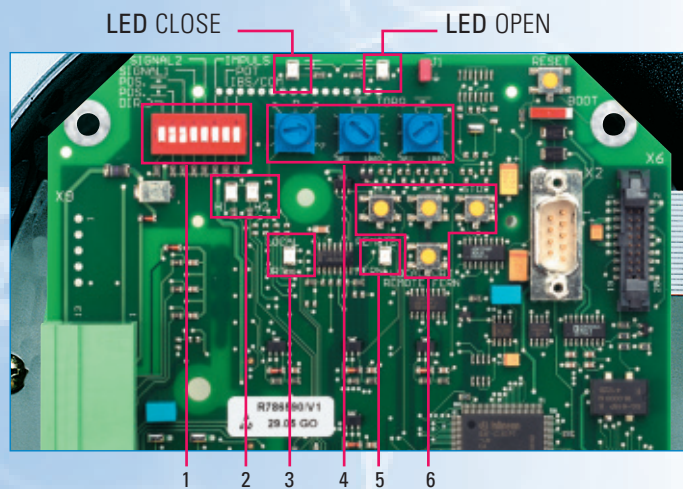
Hand crank / hand wheel

Can be locked to prevent unauthorized use.

The local control station: Everything under control

Settings for the SIPOS 5 Flash ECOTRON

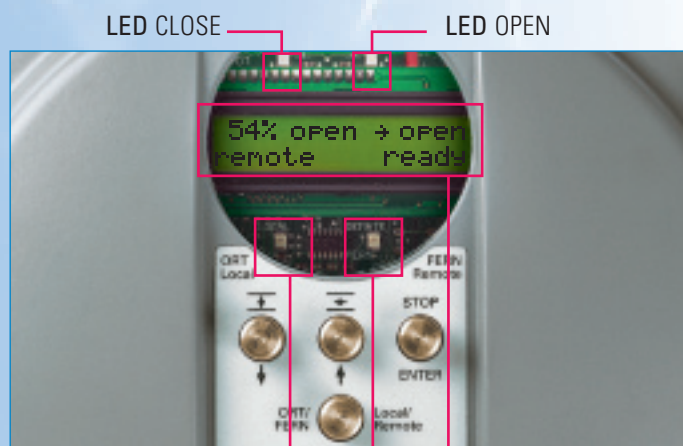
Tripping torques and output speed are set via potentiometers. Cut-off mode for each end position is set via DIP-switches.



- 1 DIP switches for valve specific values
- 2 LEDs indicate end position adjustment respectively status / fault display
- 3 LED indicates LOCAL operation
- 4 Potentiometer for setting of output speed and torques / cut-off forces
- 5 LED indicates REMOTE operation
- 6 Internal push-buttons OPEN, CLOSE, STOP, LOCAL/REMOTE

Programming unit for the SIPOS 5 Flash PROFITRON

All settings can be made using the local control pushbuttons. The plain text display is self-explanatory – with language selection.



- 7 LED LOCAL
- 8 LED REMOTE
- 9 Menu driven display

SIPOS 5 Flash actuators have a local control station as a standard feature for both electrical operation and commissioning. Most of the settings are pre-programmed in the factory and the actuators arrive at site ready for operation.

Subsequent changes are possible at any time by means of simple configuration, without the need for additional equipment or special tools. The SIPOS 5 Flash provides all the necessary information to support this activity.

In common with all electric actuators, the cut-off mode (torque or travel dependent), can be set for both end positions. A microcontroller automates this process, reducing effort to a minimum.

Reliable travel detection and torque limitation

The SIPOS 5 Flash detects travel with a precision potentiometer, or a magnetic angle sensor for contact-less position detection, via the adjustable signaling gear. Torque limit and cut-off is performed by the frequency converter, which has the advantage of avoiding the need to use torque / travel switches and minimizing effort in set-up. The cut-off torque values in the CLOSE and OPEN directions are set with potentiometers (ECOTRON) or, in the case of the PROFITRON, by means of software configuration. The microcontroller software automatically performs logical assignment of 'torque before travel' and vice versa.

SIPOS 5 Flash ECOTRON

The ECOTRON is set by means of DIP switches and potentiometers. LEDs indicate the current operating status and are also used for indicating faults and facilitating diagnosis.

SIPOS 5 Flash PROFITRON

For enhanced user-friendly operation PROFITRON actuators feature a two-line LCD plain text display. This is visible through the window in the electronics cover and provides step by step task instructions. Parameters are entered via the 'easy to use' local control station. Configuration can be carried out without opening the actuator, i.e. non-intrusively, whilst unauthorized access is prevented by a PIN security code.

Commissioning

At the press of a button, the OPEN and CLOSE end positions sequence alternately. The microcontroller detects and stores the end positions from the setting of the precision potentiometer, or a magnetic angle sensor (optional).

Menu driven display for PROFITRON in many languages (more languages can be added)

	Language display menu: nine languages are currently available (DE, GB, FR, ES, IT, PL, CZ, SE, NL, ...).		Action when line break detected: go to EMERGENCY position or hold position.
	Output speed - OPEN, CLOSE and EMERGENCY operation speeds are set independently. Only available output speeds for the specific actuator type are displayed.		Close tightly means that when running in direction 'end position' within the end position range the actuator continues to run until the end position is reached even if the control signal is terminated in advance.
	Cut-off mode (torque or travel dependent) for OPEN and CLOSE direction (separately adjustable).		The EMERGENCY position can be chosen freely.
	Tripping torque in OPEN and CLOSE direction (separately adjustable).		Two freely programmable intermediate contacts are available.
	An electronically controlled motor heater prevents condensation in widely varying ambient temperatures.		Slope for feedback signal, adjustable 0 or 4...20 mA, rising or falling.
	Procedure for end position adjustment.		Eight freely programmable binary outputs are assignable with a multitude of signals. Level active high or active low can be set freely.
	Procedure for recording of up to three valve torque curves.		Setting the fieldbus parameters. E.g. PROFIBUS address
	End position range OPEN and CLOSE adjustment. Influence on output speed, 'end position' signal and torque dependent cut-off.		Sub-menu for maintenance interval setting.
	Adjustment 0/4...20 mA and rising and falling slope for positioner operation.		Menu to set 20-digit actuator identification tag.
	Level of inputs OPEN / CLOSE / STOP: active low or active high.		All optional software functions can be enabled later using a PIN code. E.g. Integrated positioner enabled
	Selection of the control input for REMOTE mode.		Analog speed setpoint and travel-speed curve can be activated independently for LOCAL and REMOTE operation. Alternatively the actuator can be run with the adjusted OPEN/CLOSE output speeds.
General adjustments	Valve specific adjustments	Control system specific adjustments	only mandatory adjustment

COM-SIPOS

Operating and parameterization program

Functionality visualization made easy

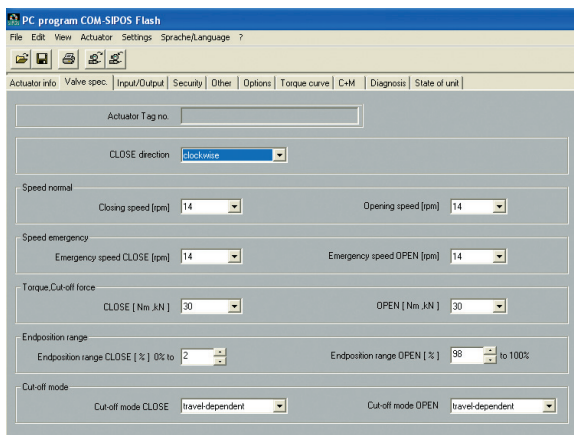
The extensive functionality and flexibility of the SIPOS 5 Flash actuator is expertly displayed and managed by the 'COM-SIPOS' PC parameterization program.

1 Visualization

SIPOS 5 Flash features a wide variety of setting options and functions - with COM-SIPOS it is possible to download all parameters and diagnostics data from the actuator and display these in clear functional menus. This gives an excellent overview of actuator settings and all other parameters (diagnostics data, status messages, torque curves, etc.).

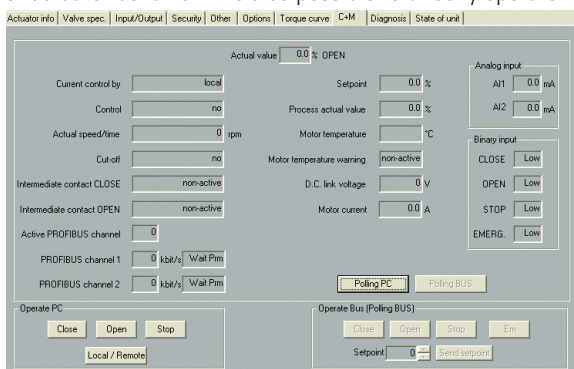
2 Commissioning

Easy actuator commissioning - all set-up data (e.g. cut-off torques, speeds etc.) is provided on-screen. Editing is straightforward and a simple key stroke uploads set-up parameters to the actuator. For safety reasons actuator end position adjustment must be carried out on site.



3 Operator control and monitoring

The 'control and monitoring' menu shows the dynamic status of control signals and allows observation of actuator behavior. It is also possible to directly operate the actuator using COM-SIPOS.



Product range

Mechanical interface

Electronics

Details

Commissioning

Control

Functions

8 Valve diagnostics

All critical actuator operating data is continuously monitored and stored. It can be readily accessed via COM-SIPOS software. Operating limits can be set in the program which, if exceeded, trigger an alarm signal. In addition, torque curves can be recorded and monitored which allows detection of changes in valve behavior (e.g. sluggishness, wear, etc.) and prompts preventative maintenance.

7 Actuator diagnostics

The actuator status can be recognized at a glance. Fault messages are displayed and a log is maintained to allow easy diagnosis and fault rectification.

6 System / actuator documentation

After commissioning, actuator data can be downloaded, e-mailed, printed or stored in a local or central file for future reference.

Uploading the archived data file into new actuator electronics has the added benefit of avoiding the need to commission additional products.

5 Actuator /system optimization

COM-SIPOS improves plant performance by allowing optimization of actuator parameters such as positioning time, braking effect or acceleration ramp, whilst simultaneously allowing observation of valve behavior.

4 Simulation

The 'simulation mode' allows testing of the feedback signal communication (conventional or fieldbus) with the respective control system. The actuator feedback signals to the control system are simulated.

SIPOS 5 Flash -

Control system interfaces

Communication made easy

The actuator is the interface between the control system and valve. The control commands, transmitted in binary / analog format or via the fieldbus, are processed by the actuator and used to operate the valve. The control system expects a feedback signal from the actuator.

The feedback signal can be a pure status message via binary output signals (e.g. torque OPEN/CLOSE, end position OPEN/CLOSE, fault, etc.) or a signal containing dynamic data (e.g. valve position) via the analog output.

All static and dynamic data is always available via fieldbus.

Control room

Control:

Binary: 24 V DC

- Permanent contact
- Pulse contact
- Two-wire

Analog: 0/4...20 mA

- Positioner
- Threshold value

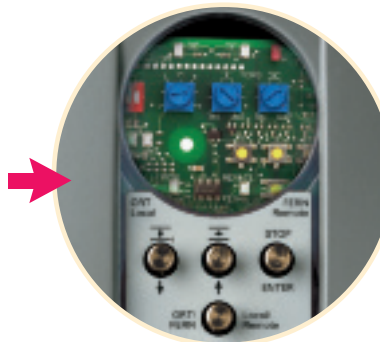
Fieldbus: RS 485 or fiber optics

- PROFIBUS
- MODBUS



ECOTRON

- 3 binary inputs
OPEN, CLOSE and STOP
- fieldbus



- 5 programmable binary outputs,
can also be output via relays
- 1 analog output
- fieldbus

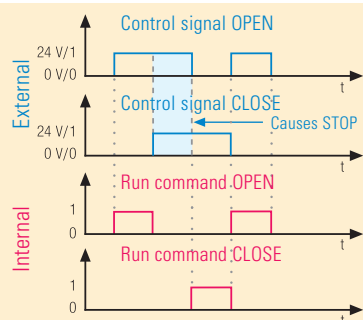
PROFITRON

- 4 binary inputs
OPEN, CLOSE, STOP and
EMERGENCY
- 2 analog inputs
- fieldbus



- 8 programmable binary outputs.
Signals and levels (NO/NC) can
be chosen, 5 outputs can
be provided via relays
- 1 analog output
- fieldbus

Control modes

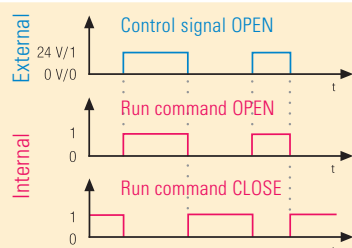
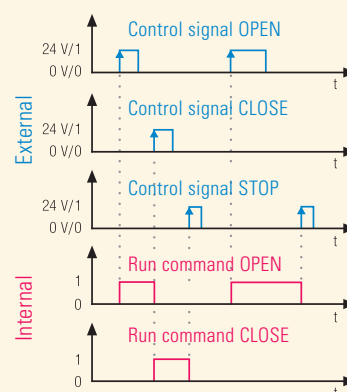


Permanent contact control

The actuator will move the valve in the required direction as long as an OPEN or CLOSE command is active. If no control signal is active or OPEN and CLOSE signals are output simultaneously, the actuator will stop.

Pulse contact control

To control the actuator a short OPEN or CLOSE pulse (at least 10 ms) is sent to the actuator. The actuator will operate until the end position of the valve is reached unless a new signal in the reverse direction or STOP signal comes from the control system.

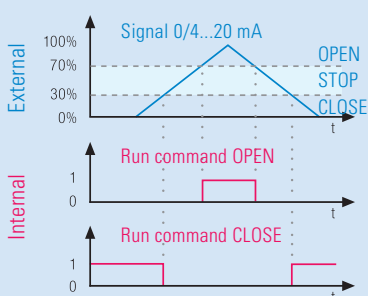
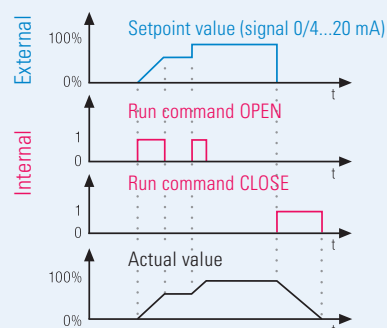


Two-wire control

The actuator is controlled via the binary OPEN input only. When a signal is active (high), the actuator moves in the OPEN direction. If no signal is active (low), the actuator moves in the CLOSE direction. In both cases the actuator operates in the given direction until either the end position is reached or the signal level changes. The actuator cannot be stopped at an intermediate position in this control mode.

Positioner control

The valve position is changed by the actuator via an integrated positioner in proportion to the setpoint from the analog input signal (0/4...20 mA).



Threshold value control

The binary information for OPEN, STOP and CLOSE is transmitted via an analog input signal.
 0 – 30 % = CLOSE
 30 – 70 % = STOP
 70 – 100 % = OPEN

Fieldbus systems replace conventional controls

In the mid 1980s great changes took place in automation technology. Before that time, parallel wiring was standard practice, however it became increasingly clear that parallel wiring was not meeting the need for communication with complex field devices which had their own local intelligence and diagnostic information. Since then more and more applications, which would previously have used conventional control technology, have been replaced by advanced fieldbus technology.

Fieldbus systems allow large amounts of information to be transmitted without the need for additional wiring. The control system can retrieve the necessary information at the required time. An overview of the two basic types of control options is provided in the following table:



Redundant fieldbus control in a large power plant

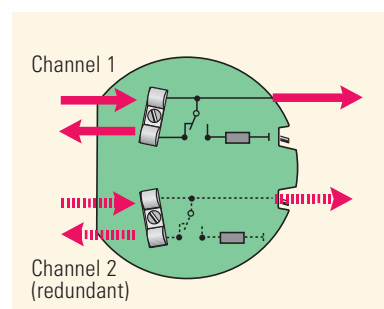
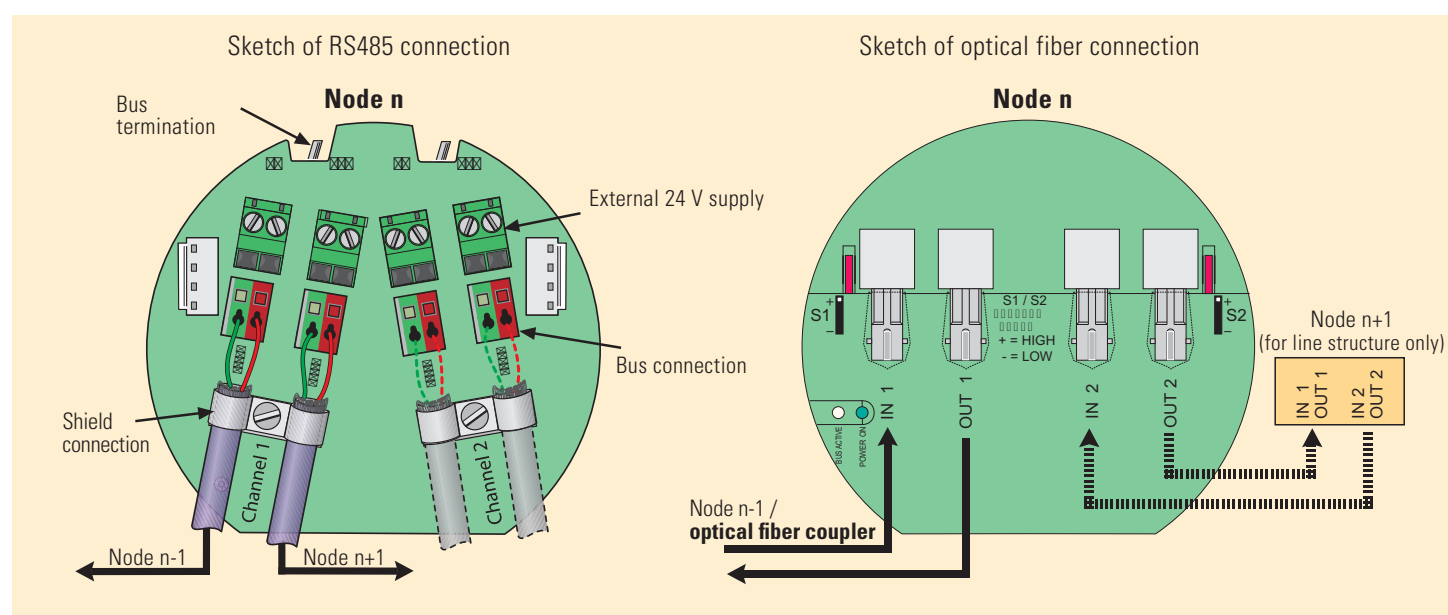


	Conventional	Fieldbus
Installation	Star-shaped wiring for each actuator - requires many, long, heavy-duty cables with costly commissioning and troubleshooting, many points of contact.	Line, star or ring topology, typically with shielded two-wire cables. Optional design redundancy is available to increase safety / availability. Long distances can be covered reliably with fiber optic converters. Generally reduced cabling compared to conventional installations.
Commissioning of the system	Multiple problems are often experienced during system commissioning due to extensive cabling. Generally greater cost and effort is incurred until field devices can be controlled fault free.	Quicker integration of field devices. Rare occurrence of faults due to simple cabling. Bus testers and monitors facilitate fault diagnosis.
Parameterization	Settings can only be made on the device itself; some proprietary PC site tools are available.	Remote parameterization via the bus during system commissioning or during operation. Some universal software tools available.
Information on actuator state	Actuator position supplied as 4...20 mA signal, approximately 3...8 signals (end positions, torque switches, fault, thermostatic switch, ...) supplied as binary 24 V signals.	In addition to the conventional installation data, detailed information such as motor temperature, process setpoint and actual value, voltage level, motor current etc. is available.
Fault diagnostics	A binary 'fault' signal, debugging on site.	Detailed messages (e.g. overvoltage, open circuit position transmitter etc.) which support rapid troubleshooting using replacement part lists.
Preventive maintenance	Regular inspection and examination of actuator and valve is required.	Feedback of diagnostic data such as number of torque-dependent cut-offs or operational hours for electronics and motor prompts preventative maintenance; feedback of torque characteristics provide service life comparison.
Expandability	Cables from the control system to the actuator have to be re-laid and, if necessary, I/O control modules have to be supplemented. The control system must be modified accordingly.	The single cable is extended to other actuators. Control system engineering must be modified accordingly.
Interference susceptibility	Costly electrical isolation may be required. Risk of invalidating signals by EMC interference.	Bus protocols exist with security mechanisms (CRC check etc.), use of interference free fiber-optic cable for critical installations (only one cable for many actuators).

Fieldbus systems are vital technology in today's automation environment and a number of standards have been established. Currently SIPOS 5 Flash supports the open fieldbus protocols PROFIBUS DP and MODBUS RTU with additional fieldbus systems in development.

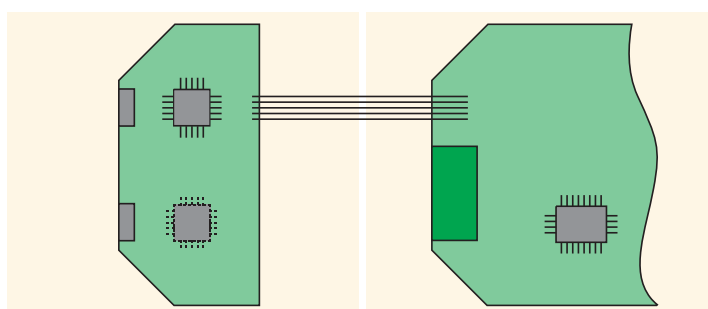
Connecting the fieldbus

For fieldbus systems supported by SIPOS 5 Flash there is direct device connection using 'RS485 bus' or fiber-optic cable.



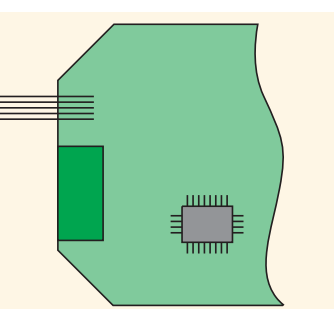
Bus connection

- With integrated, switchable bus termination
- For 1 or 2 channels
- Bus is looped through, even when the plug is removed
- Line is separated when the termination is switched on
- 24 V supply can be connected directly
- Separate bus and power supply connection
- Large shield connection



Fieldbus module

- Electrical isolation
- Protocol processing
- Buffer memory storage
- Variants 1 or 2 channels



Control electronics

- Protocol evaluation
- Bus parameterization

Open Communication via PROFIBUS DP – Control and diagnostics without limits

The fieldbus standard **PROFIBUS DP** is distributed worldwide. It provides exceptional device availability through proven security mechanisms and efficient high-speed data exchange ensures rapid signal communication. SIPOS is a member of the PROFIBUS user organization (PNO) and, since the launch of the SIPOS 5 Flash actuator series, has supported the bus protocol with approved and certified control systems. All protocol upgrades are promptly implemented.



SIPOS 5 Flash supports the following PROFIBUS DP functions:

Functional level DP-V0

Provides cyclical reading of input data from the master and writing output data as a fieldbus slave with a transmission rate of up to 1.5 MBaud. SIPOS 5 Flash has a special feature that allows parameter data to be transmitted cyclically. This means that critical parameters such as actuator speed can be changed online.

Functional level DP-V1

Acyclical data exchange with a master controller (DP master Class 1) or engineering station (DP master Class 2) is supported. The Class 2 master can be deployed for configuration and diagnostics as all Flash parameters are accessible. The torque-curve function for the PROFITRON actuator can be activated and recorded curves can be read and displayed via the V1 services.

Functional level DP-V2

SIPOS 5 Flash actuators support time stamp and slave redundancy according to the 'RedCom' profile.

PROFIBUS DP functions

Functional levels

DP-V2

Expansions

- time synchronization
- time stamp
- redundancy

DP-V1

- acyclical data exchange between PC or control system and field devices with the expansions
- Integrazione in engineering tools: EDD e FDT

DP-V0

- cyclical data exchange between control system and field devices with the expansions
- GSD configuration
- diagnostics

Device characteristics

Time

Product range

Mechanical interface

Electronics

Details

Commissioning

Control

Functions

Control system integration

Today's control systems do not work in isolation and manufacturers must ensure that field device communication protocols are made available to, and fully integrate with, process control equipment.

The SIPOS 5 Flash provides such compatibility.

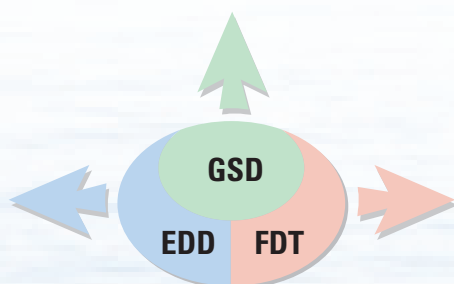
- ➔ Device master data file (**GSD**) – part of every DP device; contains general-purpose and device specific information
- ➔ Electronic device description (**EDD**) - proven in the field for integration into the SIEMENS system SIMATIC PDM
- ➔ Device type manager (**DTM**) for the FDT interface (field device tool) – successfully tested with FieldCare, PACTWare and ABB Composer systems – among others

Network configuration

- ➔ Start-up configuration
- ➔ Fixed configuration
- ➔ Straightforward

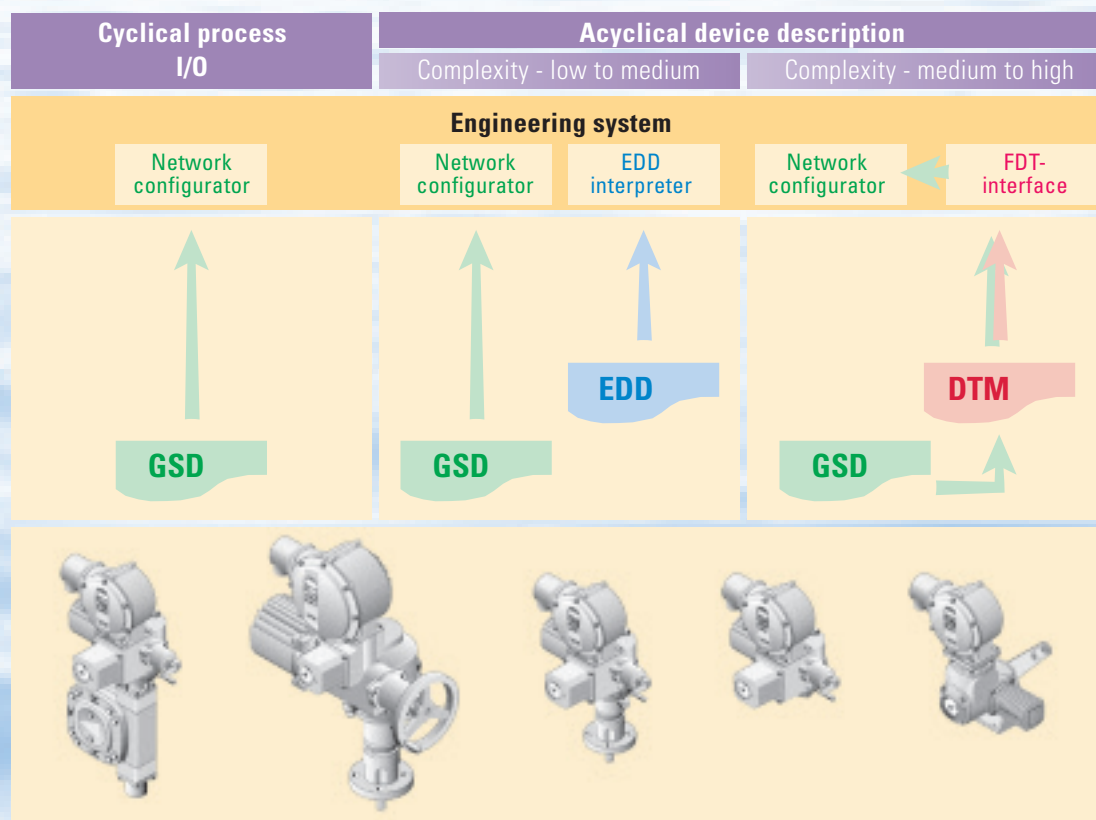
Interpreter

- ➔ Uniform device handling
- ➔ Description language (DDL)
- ➔ Low to medium complexity

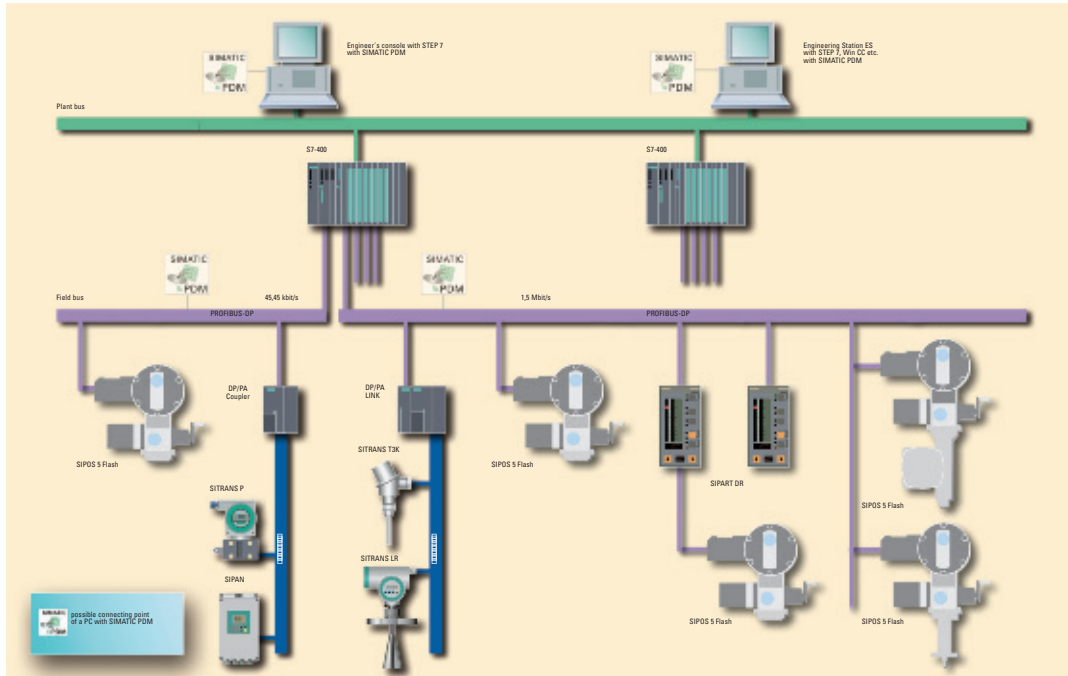


Program

- ➔ Device-specific handling
- ➔ Application interface
- ➔ Medium to high complexity



PROFIBUS communication with SIPOS 5 Flash



Customized function blocks and faceplates for different control systems e.g. Siemens SIMATIC PCS7 or SPPA-T2000, -T3000.

SIMATIC PCS7 family **function blocks** and **faceplates** (Win CC) are available for SIPOS actuators. These function blocks can also be used for SIMATIC S7-300 controls.

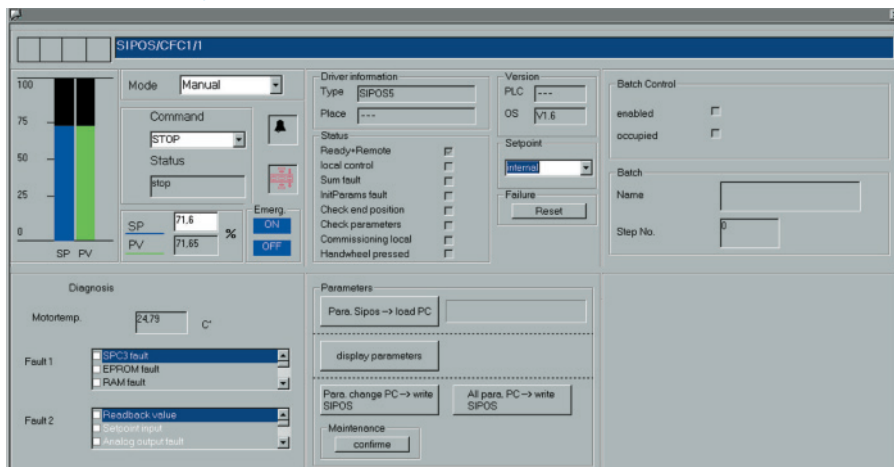
SIPOS integration is available for the cross-level configuration tool **SIMATIC PDM** (Process Device Manager) which is not specific to any particular manufacturer.

A function block for SIPOS actuators is also available in the Siemens process control system **SPPA-T2000, SPPA-T3000**.

SIMATIC PCS7 function block

6	SIPOS5	QB3E
SIPOS5	6/-	
0	BO EXT ERR1	QERR BO
0	BO EXT ERR2	QACKF BO
0	BO EXT ERR3	QPARF BO
0	BO AUTO ON	QPARF BO
0	BO AUTO OC	QSPINTEN BO
0	BO MAINT OK	QSPKTEN BO
0	BO L SAFE O	QSPKTEN BO
1	BO SAF OP E	PV E
0	BO L RESET	QOP OP BO
1	BO OP OP EN	QCL OP BO
1	BO CL OP EN	QST OP BO
1	BO ST OP EN	QSAF OP BO
0	BO LINK MAN	QOPENING BO
0	BO L OPEN	QOPENED BO
0	BO L CLOSE	QCLOSING BO
0	BO L STOP	QCLOSED BO
20s	TI E TIME P	QTOR OP BO
1	BO MANOP EN	QTOR CL BO
1	BO AUTOP EN	QOPERATE BO
0	BO LIOP SEL	QREMOTE BO
0	BO AUT L	QLOCAL BO
0	R SP EXT	QGR ERR BO
1	BO SPINT EN	QTIMEOUT BO
1	BO SPECT EN	QMAN AUT BO
0	BO LIOP INT	QMANOP BO
0	BO SPEKON L	QAUTOP BO
16#1	BY SUBN ID	QOP ERR BO
16#0	W RACK NO	QSAFE ON BO
16#0	BY ALLOC IN	QSTW W
0	I P NO IN	QMSG ERR BO
16#0	DW P VAL IN	QMSG SUP BO
11	I PCD 3 IN	MSG STAT W
70	I PCD 4 IN	MSG ACK W
71	I PCD 5 IN	OPPO ERR BO
16	I PCD 6 IN	PCD 3 W
1	I PPO TYPE	PCD 4 W
0	BO SAFE ON	PCD 5 W
0	BO CTRL MOD	PCD 6 W
0	BO PAR MODE	ALLOC W
0	BO PNU DWN	P NO I
		P VAL DW
		QCTRL MO BO
		QPARMODE BO
		QES P BO
		QFF OK BO
		QLS OK BO
		QAP OK BO
		QHW OP BO
		Q DWN OK BO
		Q CTRL O BO

SIMATIC PCS7 faceplate



Easy communication via MODBUS RTU – “conversation” on a widely used platform

Since the late 1970s, MODBUS has been available as a bus protocol for fast, straightforward connection between an (I&C) master and many slaves (actuators, sensors).

In contrast to PROFIBUS, MODBUS has protocols of different lengths for accessing data structures – from reading and writing single bits (→‘Read Coil Status’, ‘Write Single / Multiple Coils’) to reading and writing entire data ranges (→‘Read Holding Registers’, ‘Write Single / Multiple Registers’) and diagnostic telegrams. Each slave does not necessarily have to be polled in cyclical, equidistant intervals.

MODBUS is used globally in industrial automation – configured as RTU (remote terminal unit - implemented in SIPOS 5 Flash), ASCII and TCP/IP.

All process data access (run commands, status information) and assigning of all actuator parameters is supported by the MODBUS slave connection in SIPOS 5 Flash.

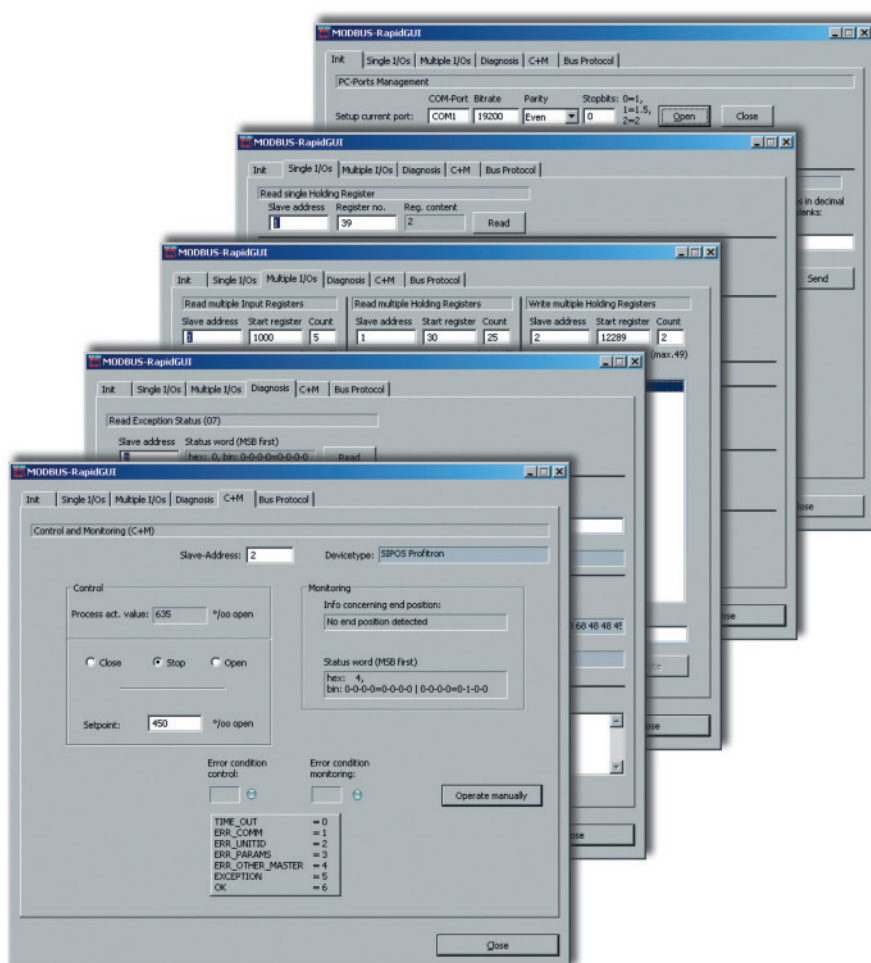
Additionally actuator information can be read out (‘Read Exception Status’, ‘Report Slave ID’ and ‘Read Device Identification’ functions).

The physical connection is, in common with PROFIBUS, via RS485 or fiber-optic cable.

MODBUS

Supported MODBUS functions:

Function code	Description
01	Read Coil Status
02	Read Input Discrete
03	Read Holding Registers
04	Read Input Registers
05	Force Single Coil
06	Preset Single Register
07	Read Exception Status
08	Diagnose
15	Force Multiple Coils
16	Preset Multiple Registers
17	Report Slave ID
43	Read Device Identification



SIMA actuator control system

Complete solutions from a single source – 'simplified' automation solutions

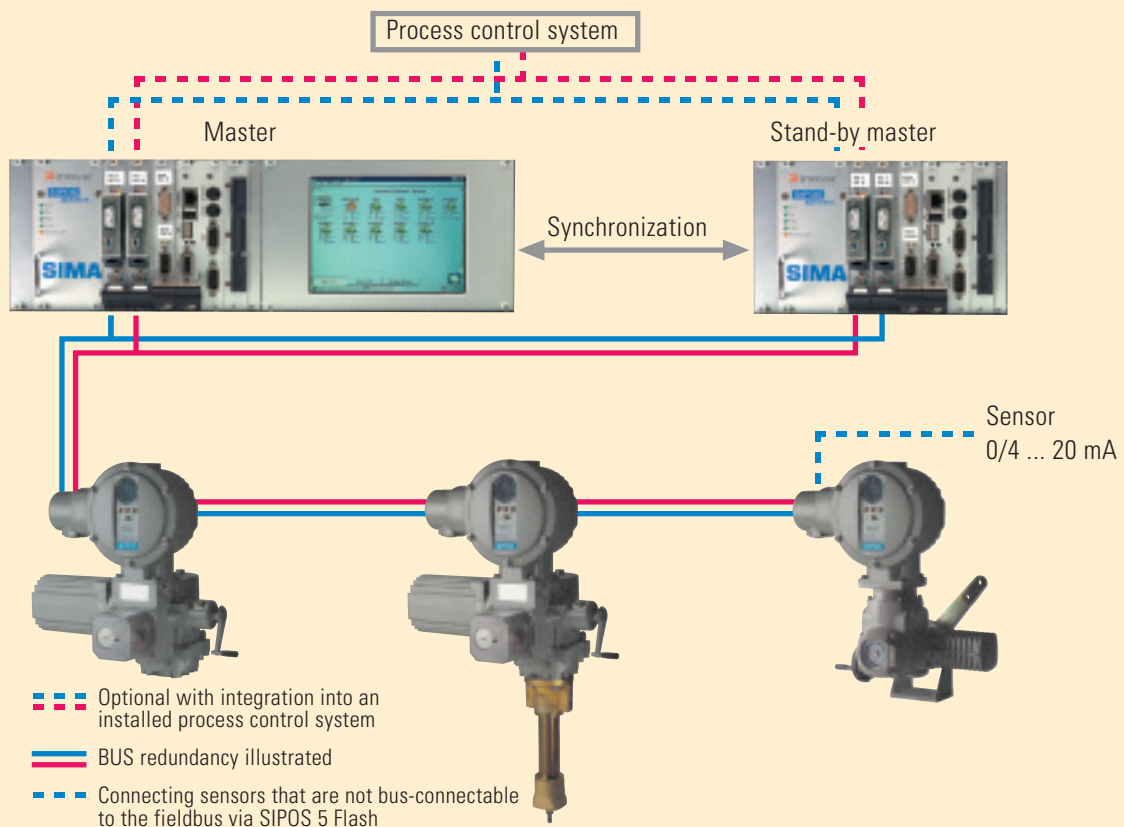
Easy commissioning 'plug and play' with system reliability and 100 % availability is demanded in today's plant environment. Problems need to not only trigger alarms but to be capable of isolation, with rapid fault diagnosis and resolution. In reality however a number of obstacles need to be overcome in the realization of such ideal systems:

The problems: Safety using redundancy strategies. This can work well, however safety concepts can be affected by component incompatibility.

Easy commissioning comes with competent, highly trained engineers using refined diagnostic software, but this comes at a financial cost. General bus concepts (PROFI, CAN, MOD, Foundation Field, Inter **BUS**) and proprietary approaches, a wide variety of I&C philosophies (meta tags, objects, tasks, ...) and a large amount of device operations are all hazards on the road to the world of automation. What system should be selected and what about compatibility issues?

The key issue raised is one of **INTERFACES** between manufacturers and devices.

The solution: A TOTAL CONCEPT where all automation levels come from a single source.



The **SIMA MASTER STATION** meets the full scope of the above specifications:

- **Safety / availability:**

The SIPOS approach is 'redundancy'. It is scalable and implemented where needed in any given application: redundant fieldbus cables to actuators; redundant MASTER STATIONS that mutually monitor each others operating capability; redundant cables to higher-level control systems (if installed). The components of the MASTER STATION are robust standard industrial-grade PCs and fieldbus modules. Rotating components such as fans and hard disks are not required thus ensuring wear-free continuous operation.

- **Interfaces:**

The interface controller \leftrightarrow actuator is traditionally problematical, however SIMA has an internal interface where both sides are supplied from a single source. This avoids compatibility issues and the use of a standard fieldbus provides further expansion capability.

Product range

Mechanical interface

Electronics

Details

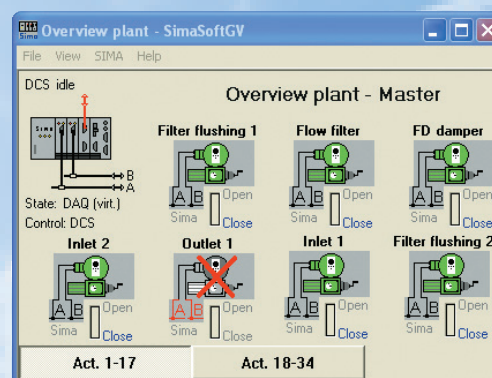
Commissioning

Control

Functions

• Easy commissioning:

It really is as simple as 'plug & play': a self-starting program scans the fieldbus lines for familiar device types and detects all SIPOS actuators automatically. These devices can then be accessed and controlled immediately in a graphical user interface – the standardized plant overview. Other field devices can be easily integrated via the digital and analog actuator inputs using the bus. Third-party devices can also be included in the scanning procedure and displayed as required.

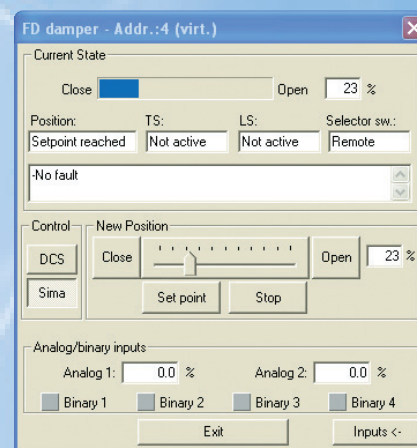


• Control and monitoring:

Both control and monitoring functions can be performed on the MASTER STATION or higher-level control system. Access rights to the control system or MASTER STATION can be assigned for all actuators, or each actuator individually.

• Remote control:

A wide range of (fieldbus) interfaces to higher-level control systems is available, however, each MASTER STATION can also be integrated into a local network via the existing Ethernet interface. In this case, access is available via server supplied software or via Windows-XP Remote Desktop.



• Diagnostics:

Comprehensive fieldbus diagnostics and information on the status of every actuator connected is available via the user interface.

• Standardization:

Hardware – industrial-grade PC.

Operating system – Microsoft Windows.

Communication bus – standard fieldbus systems such as PROFIBUS or MODBUS.

• Flexibility:

System options exist such as a choice between integrated 'Touch Screen' or no monitor and 24 V DC connection or 230 V AC – many variants can be combined to enable complete customization to meet specific system requirements.

SIPOS already offers the user a wide range of bespoke actuator control solutions, however the range is continuously being expanded. Here are just a few examples of our latest enhancements:

- integration of simple sequence controls
- integration of other field devices (sensors and actuators)
- system extension for new bus systems
- translation into different languages
- integration of fiber optics and wireless communications
- complete system package including control cabinet and actuator wiring

In addition to the MASTER STATION, a large range of accessories can also be supplied such as: repeaters, active bus terminators, fieldbus cables, bus converters for analog and digital signals (fieldbus I/O systems), bus connectors, power supply units and many more.

Uninterruptible or mains-independent power supply - ... from the mains or via solar power

Everybody knows what power supply that is independent of the mains supply is: the emergency generator.

Where there is no supply connection, but where electrical loads are needed, the emergency generator with its independent power source (comprising I.C. engine coupled with a generator and power electronics) comes to the rescue.

Even if the existing mains supply fails, the emergency generator assures the availability of the necessary electrical power, so that any necessary electrical work can still be carried out in emergencies; it fulfils the function of an **uninterruptible power supply (UPS)** system.

In the classical **UPS** the a. c. voltage of the mains supply network is rectified by the UPS system connected to the loads. This DC voltage is the power source for the integrated inverter that converts the DC voltage to single-phase AC voltage and feeds it to the loads. Simultaneously, a battery is loaded as an energy store.

In the case of malfunction - when the mains supply fails - the load then obtains the necessary electrical power via the inverter from the battery.

If there is no mains supply to charge the batteries, this can be compensated for by solar power – **photovoltaic energy** and the innovative power electronics in SIPOS 5 Flash make all this possible.



Schematic of stand-alone operation with solar power

(from left to right: solar module, batteries, charger control, inverter and SIPOS 5 Flash rotary actuator)

Single phase low power operation keeps costs down

In contrast to other manufacturers, who assume a three-phase 400 VAC power supply, we offer – in the low to medium range – SIPOS 5 Flash actuators that can be operated with a single-phase power supply as a standard.

Product performance is not compromised due to the innovative use of integral frequency converters allowing the benefits of robust three-phase AC motors to be exploited.

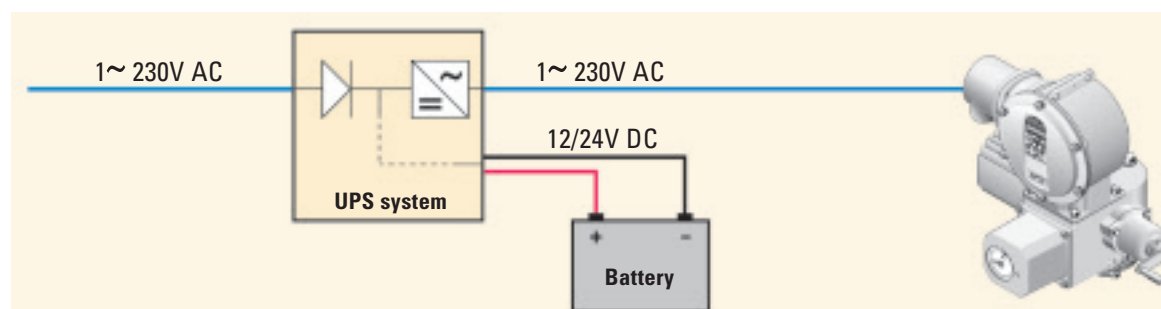
The low power consumption of the SIPOS 5 Flash also means that all power supply components can be designed to a reduced power specification.

The fact that the starting current is never greater than the nominal current is an added factor that impacts positively when designing a UPS or solar power system (e.g. cheaper single-phase technology can be utilized instead of the expensive three-phase inverters).

Uninterruptible power supply

Actuators that need to remain operational during a power outage can be connected to a UPS.

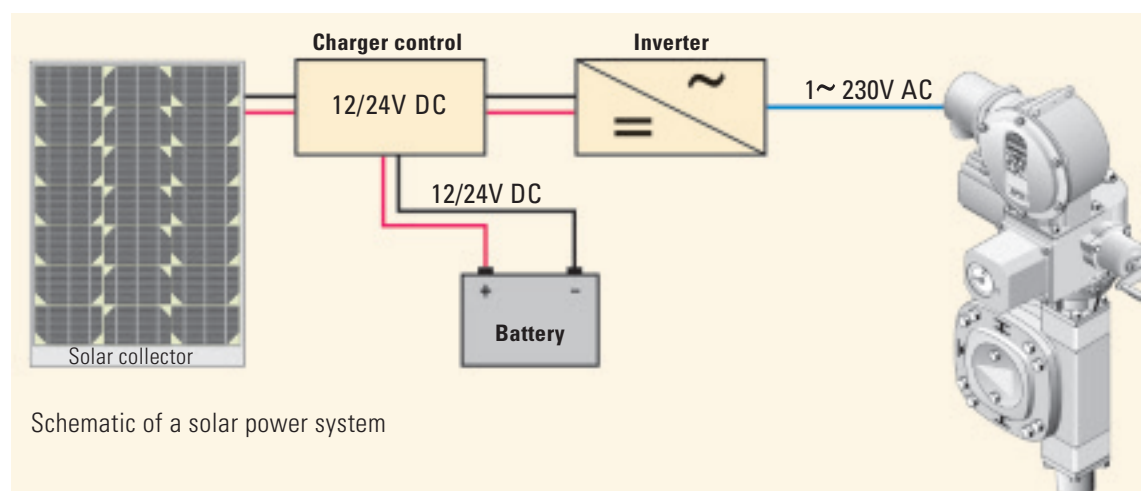
This can be a low cost unit due to the SIPOS 5 Flash low start / nominal current and single-phase connection.



Schematic of an uninterruptible power supply system

Mains independent solar power supply

The solar energy system can operate as a stand alone power source: this is beneficial when the installation site of the actuator is outside the range of the electricity grid and it is uneconomical to install its own supply line.



Schematic of a solar power system

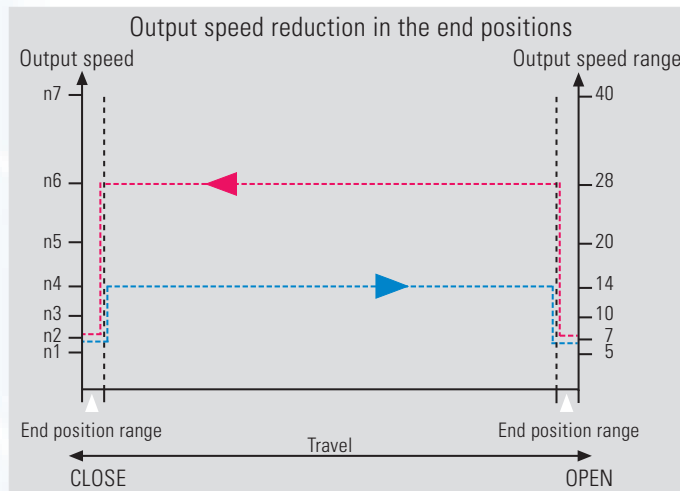
SIPOS 5 Flash – the clever way to go easy on your valve

Speed reduction in the end positions

Powerful but gentle –
Standard function

Driving a valve hard into or out of its end position can cause seat damage, resulting in additional maintenance costs and plant downtime. The SIPOS 5 Flash with its integrated frequency controller automatically reduces the motor speed, whilst controlling torque, as the valve is close to its end position thus moving the valve more gently and reducing wear. In the event of a blockage, the sophisticated torque control achieved with the frequency converter lessens the likelihood of valve problems.

Each SIPOS 5 Flash actuator has seven adjustable speeds within selectable speed ranges.



Gentle movement into or out of the end positions of the valves (example)

Positioner

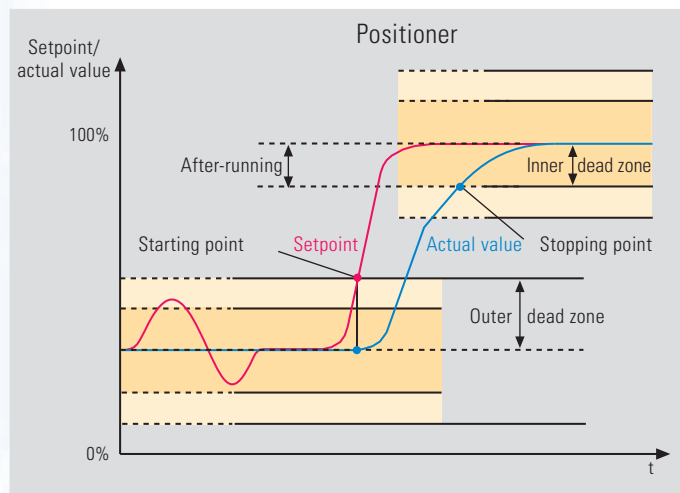
Adaptive three-step controller –
optimizes the process and relieves the valve

The integrated positioner of the SIPOS 5 Flash PROFITRON electronics is an adaptive three-step controller, i.e. the dead zone is always modified based upon the quality of the setpoint and actual-value signals. This ensures the greatest possible control accuracy with minimum switching frequency, thus optimizing the process and reducing switching cycles to protect valves and pipelines from wear.

Additional features of the positioner:

- Soft start and electronic braking.
- Speed reduction before reaching the stopping point.
- Possible after-running is evaluated and taken into account.

The positioner continuously detects and compares the setpoint and the actual value. If the control deviation is greater than the dead zone, internal travel commands are generated.



leaving outer dead zone determines time of starting

reaching inner dead zone determines time of stopping

Split range control

Split analog signal - controls actuators that operate together

For applications with a wide flow range, e.g. with flow regulation through large pipes, the limits of control of a single control element can be rapidly reached, as the desired accuracy over the entire flow range cannot be provided. In these cases a split-range arrangement should be used, which is beneficial as the output signal from the controller is divided among two (or more) actuators.

This function can also be used to normalize the effective control range of a valve (e.g. 20 – 80 %) to the input signal (e.g. 4...20 mA).

Example:

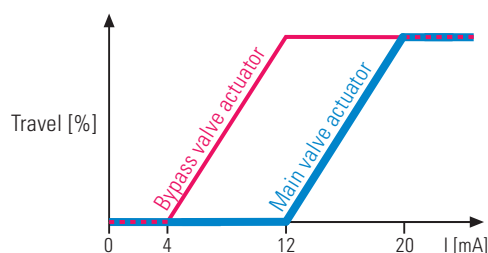
Bypass application

One large and one small valve are installed in parallel within the piping.

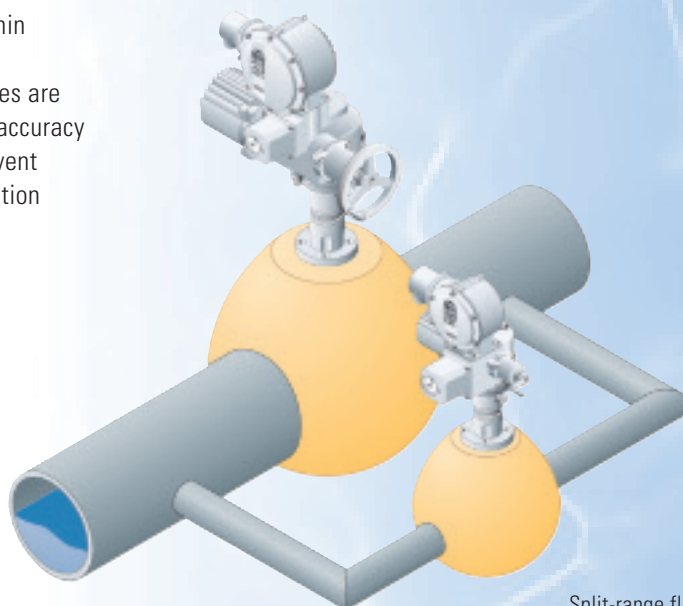
The small valve is opened at low flow rates, and both valves are opened at large flow rates. For low flow rates the control accuracy is significantly improved. This arrangement also helps prevent water hammer and reduces the torque necessary for operation of the large valve.

(→ smaller actuators can be used).

Adaptive positioner with split range function



Example: — Controlled within analog control signal range 4...12 mA
— Controlled within analog control signal range 12...20 mA



Split-range flow regulation

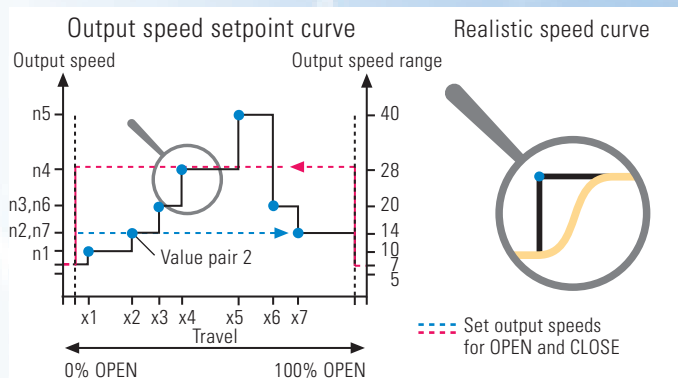
Travel-dependent valve speed adjustment

Use of simpler valves by linearizing valve characteristics

Where processes are complex, it is desirable to achieve a proportional relationship between valve travel and flow-rate of the medium. The SIPOS 5 Flash PROFITRON enables this by changing the valve speed during transition from OPEN to CLOSE and vice versa.

Different speeds can be specified along the length of travel to a maximum of 10 interpolation points which becomes the speed characteristic curve. The travel/speed interpolation points are set locally by means of push buttons via the plain-text display or the PC-parameterization program, COM-SIPOS.

This function is called the „travel-dependent output speed adjustment“ and is mainly used for linearizing valve characteristics.

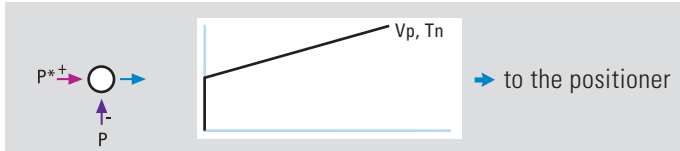


Linearization of valve characteristics

Due to the inertia of the actuator and valve, the staggered travel/speed interpolation points result in a smooth speed characteristic, which can be further adapted by changing the ramp-up time parameter.

Process controller

Direct sensor feedback - automatic actuator control



Autonomous solutions, where process controllers are built into field devices, are becoming more common within industrial valve automation. Integrating such functionality into actuators reduces the need for cabling and control cabinets, when compared with conventional control technology, producing major cost savings and simplifying installations, particularly in remote locations.

SIPOS - integrated process controllers

Some of the benefits:

- Savings in equipment and installation costs as there is no need for separate, dedicated process controllers and associated control cabinets / power supplies.
- Improved environmental protection as the controller integrated in the SIPOS 5 Flash actuator is embedded in the actuator housing offering IP 67 or IP 68 (optional) protection.
- Simple connection to remote stations either via conventional wiring or fieldbus.

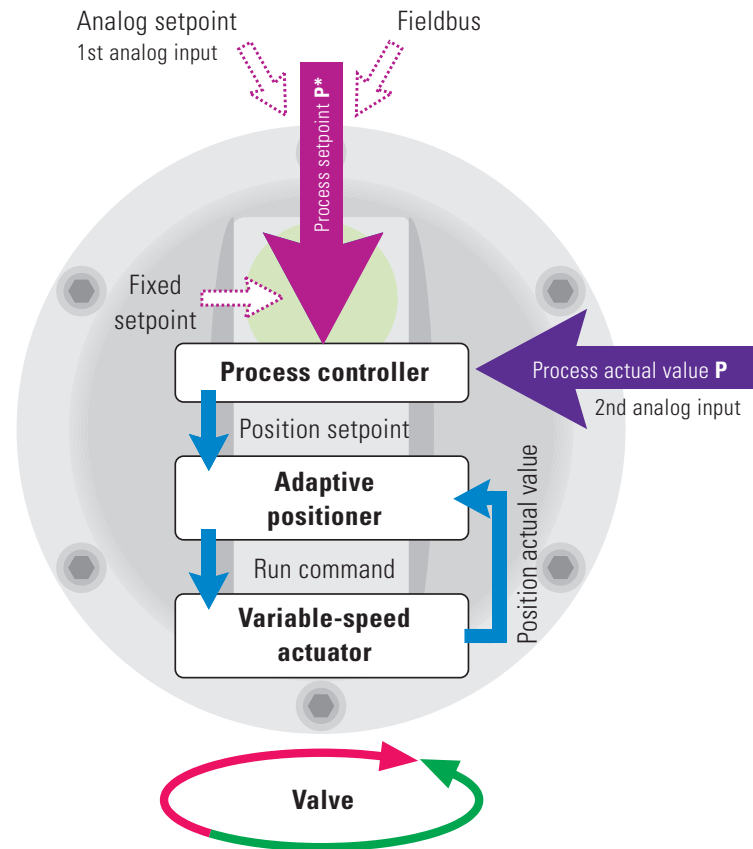
Design

The integrated process controller is a classical PI controller. Gain V_p and reset time T_n can be adjusted. When the controller output limit is reached the I-portion is brought to bear so that the controller can release itself from the limit at any time ("anti-reset-windup-structure"). The cycle time is 18 ms.

The **controller output** acts as a **setpoint for the internal positioner**.

The setting of parameters for the process controller depends to a large extent on the controller application.

A PI controller is typically sufficient for almost all applications.



The process controller can be controlled via an external or internal setpoint value.

The following control modes are available:

Process controller - conventional:

The setpoint comes from the first analog input (0/4...20 mA).

Process controller - BUS:

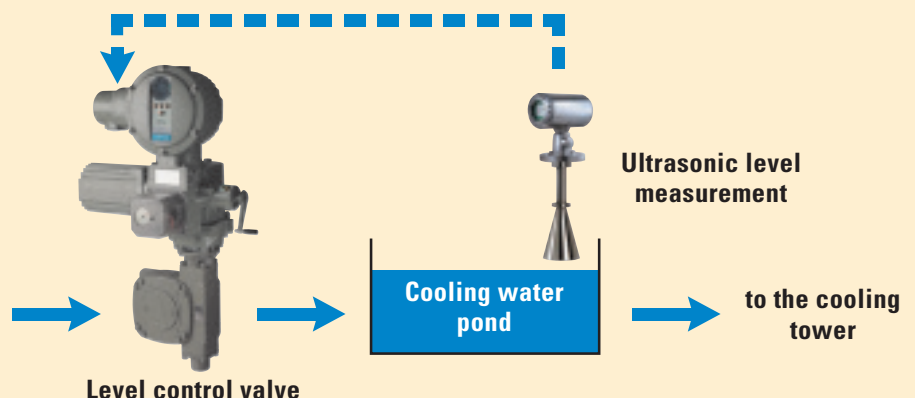
The setpoint comes via the fieldbus.

Process controller with fixed setpoint:

The setpoint is configured internally as a fixed setpoint (0...100 %).



Example: **level control** in a cooling water pond for a power plant



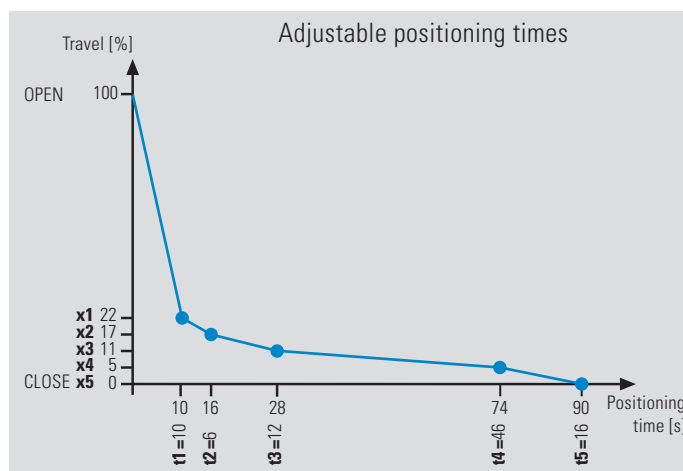
Travel-dependent adjustable positioning times

Additional actuator positioning time flexibility

Control loops designed to adjust the mass flow rates of fluids, gases or bulk materials can only be as good as the specification of the valve and actuator installed in the system. SIPOS 5 actuators have an integrated frequency converter which offers further potential for optimization with the **travel-positioning time function**:

By specifying up to ten pairs of values, comprising travel position [%] and positioning time [s] the desired positioning time for the given section of travel can be set.

The entered positioning time t_n describes the time from the previous travel position $[x_{n-1}]$ to the desired travel position $[x_n]$. Both travel positions are specified as a percentage of the full travel.



Application

This function is primarily used to **prevent water hammer**.

Benefits for the user:

- The desired valve position is reached within a defined period.
- Values are entered in familiar units without conversion.
- Extremely low positioning speeds can be achieved.

Plotting torque characteristic of the valve

Monitoring valve status

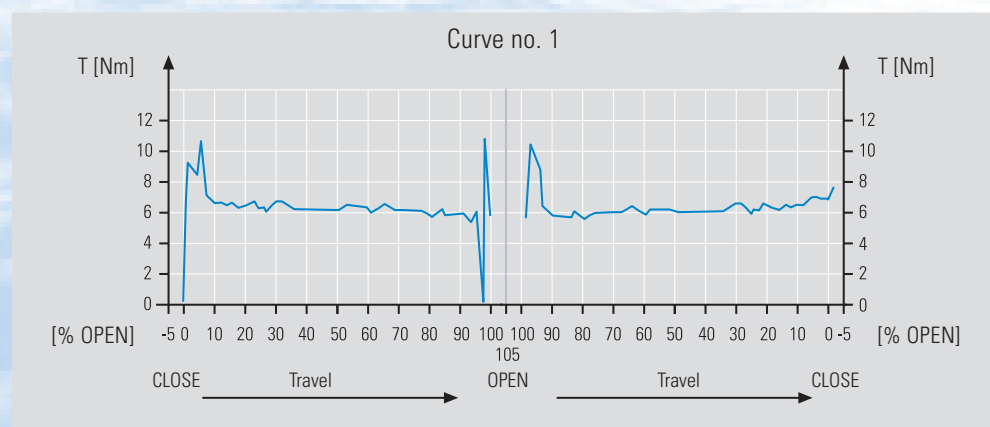
Wear, deposits or corrosion will make valves stiff or lead to complete blockage.

It is more efficient to adopt a need-oriented rather than time dependent preventive maintenance schedule.

The SIPOS 5 Flash PROFITRON facilitates this in two ways:

Firstly, valve-specific and service dependent maintenance intervals or limits can be set for operating hours, torque-dependent cut-offs and switching cycles – these can be specified in advance which generates a maintenance signal when the specific maintenance parameter is reached.

Secondly, the condition of the valve can be evaluated at any time by recording the required valve operating torque levels. At sampling rates using 1% increments of the travel, up to 3 torque curves can be permanently stored. With COM-SIPOS, the data can be downloaded via the serial interface or the PROFIBUS interface and readily checked. Changes are immediately detected by comparing the data with the reference records and any required service intervention can then be actioned.



Torque curve of a valve

Torque-curve recording can be started via the actuator's local control station, COM-SIPOS or PROFIBUS DP-V1 during acyclical operation.

Analog output speed control

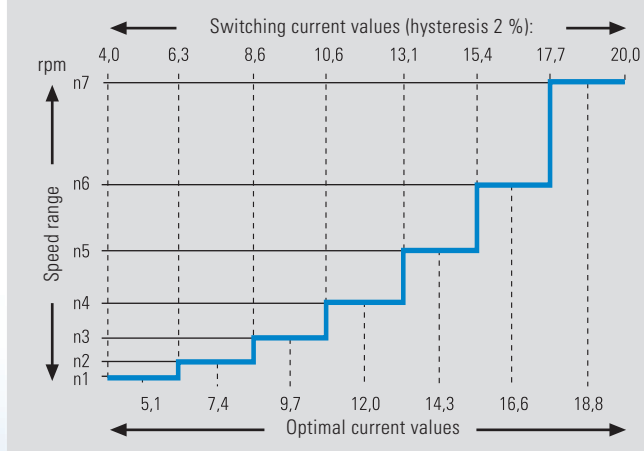
Output speed changes during ongoing operation - reducing the number of switching cycles

Precise process control is increasingly demanded. An actuator needs to both, react sensitively to small changes, which it can only do by low speed corrections, but also react rapidly where large deviations between the actual value and setpoint exist.

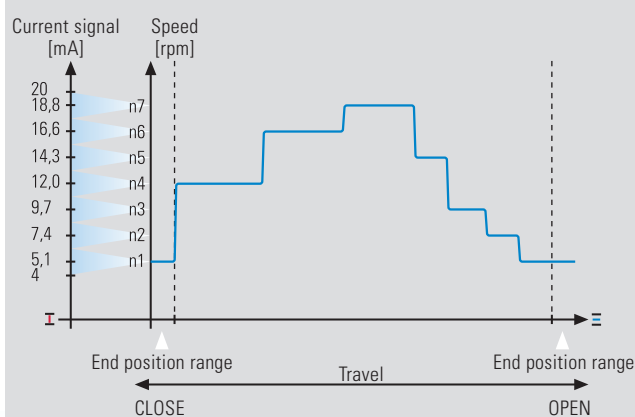
The SIPOS 5 Flash is able to manage these apparently conflicting requirements using the 'external analog speed setpoint' function. The actuator can be operated at different speeds without changing parameters with the output speed specified by a 0/4...20 mA signal at the second analog actuator input.

The result is not only greater fluid control precision, but pressure surges in pipes can be effectively prevented by using low speed valve closure. In addition using the maximum actuator travel speed, cavitation, if the flow speed is increased due to pressure, can generally be avoided. In this way the SIPOS 5 Flash provides protection against transient stress and wear on the pipeline and valve.

Conversion of an analog current signal into speed (here 4...20 mA):



Example of output speed control



SIPOS Aktorik GmbH

Im Erlet 2

D-90518 Altdorf/Germany

Phone +49 9187 9227-0

Fax +49 9187 9227-5111

info@sipos.de

www.sipos.de

Our Fax no.: +49 9187 9227-5111**Electrical actuators and actuator control systems****Inquiry form****Information required****Complete catalog** ☐ German ☐ English

Contains ordering data, technical data, instruction manuals, certificates and general information for rotary, linear and part-turn actuators (including accessories and spare parts lists).

Catalog/Internet CD ☐ German/English**Product selection CD** ☐ Ten languages selectable

Contains the full product range. Menu driven selection which outputs product descriptions, dimensional drawings, diagrams, technical details and commercial data.

Other productsActuator control systems ☐Actuators for nuclear power plants ☐2-motor actuators ☐**Action required**☐ Quotation☐ Call☐ Visit☐ Presentation**Your inquiry:****Your personal details**☐ Mrs.☐ Mr.

Name

Company

Phone

Street / no.

Country

Department

Fax

Postal code / City

E-Mail

Sales and Service –
worldwide



○ SIPOS Aktorik Germany

Sales headquarter and production

Phone +49 9187 / 9227 - 0

Fax +49 9187 / 9227 - 5111

info@sipos.de

www.sipos.de

Service hotline

Phone +49 9187 / 9227 - 5214 or 5215

service@sipos.de

2012 >> Edition 03/12 <<

SIPOS Aktorik GmbH

Electric actuators

Im Erlet 2

D-90518 Altdorf, Germany

Subject to change without notice

www.sipos.de

Order no. **Y070.104/GB**

Print 03.12/1.0