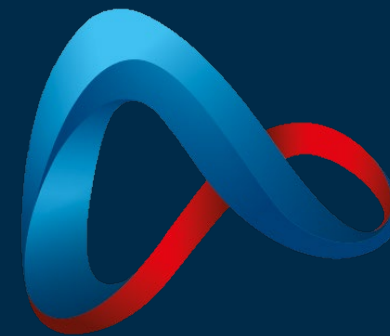


# Welcome to our Web Seminar



# H4U

## HYDRAULICS FOR YOU

THE INTELLIGENT MOVE

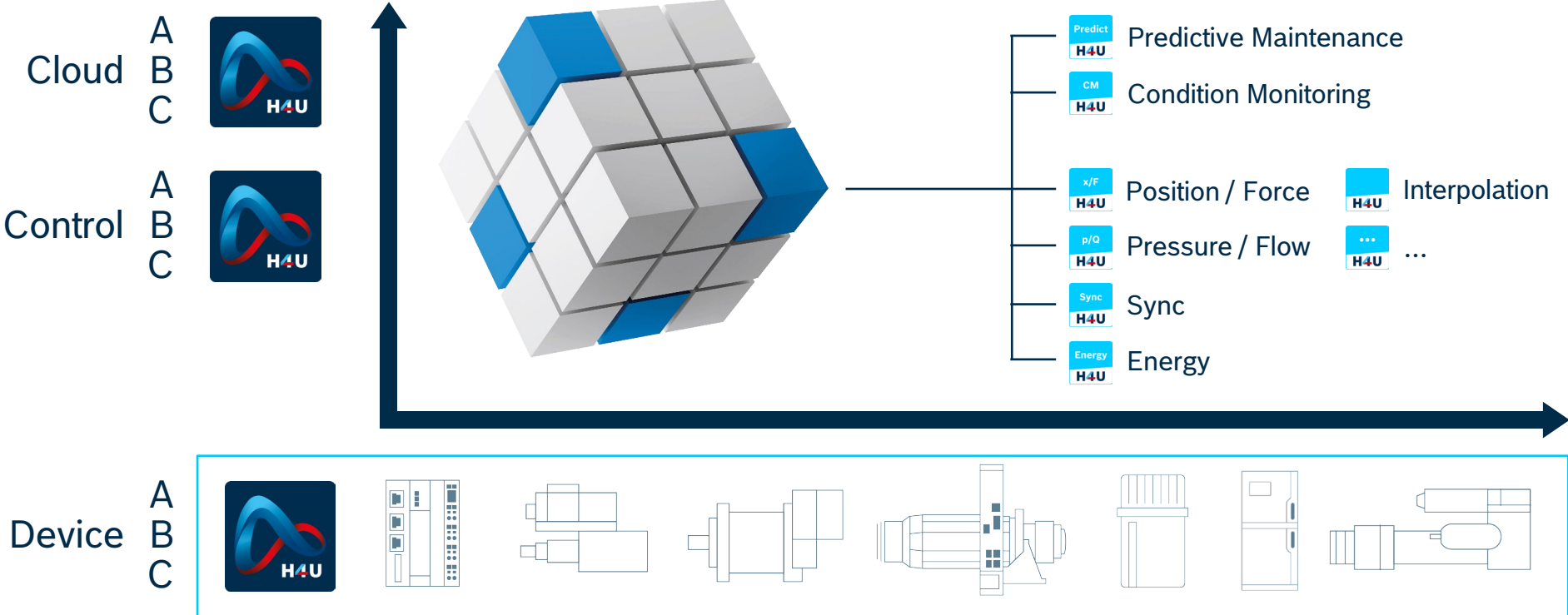
[www.boschrexroth.com/H4U](http://www.boschrexroth.com/H4U)

**rexroth**  
A Bosch Company

# H4U – Hardware independent Software Platform

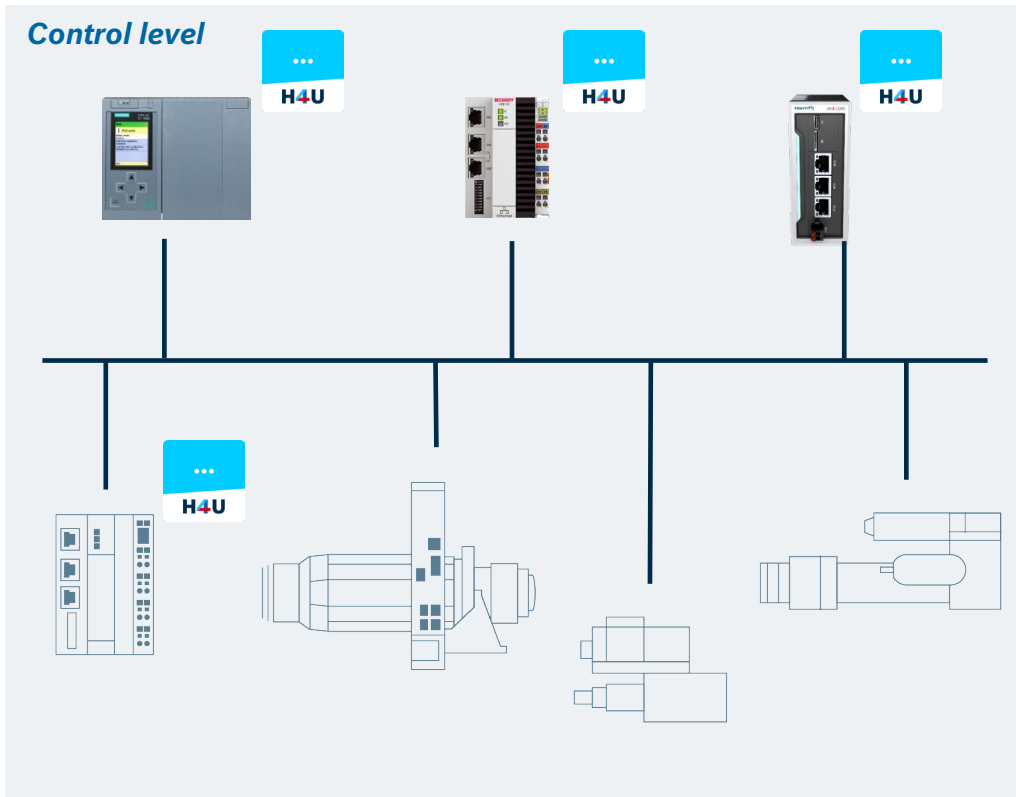


Embedded in open source or established automation ecosystems



# PLC function blocks for hydraulic control functions

## Benefits



- Implement control concepts flexibly and in the best possible way.
- Realize hydraulic control functionality with control hardware that is already in use – no additional control hardware required.
- Engineering and commissioning in your automation environment
- Hydraulics know-how as software - always up-to-date, always perfectly matched to our hydraulics components.

H4U.app offers additional options for implementing hydraulic control technology...

# H4U.app – Software for hydraulic control functions

## Product



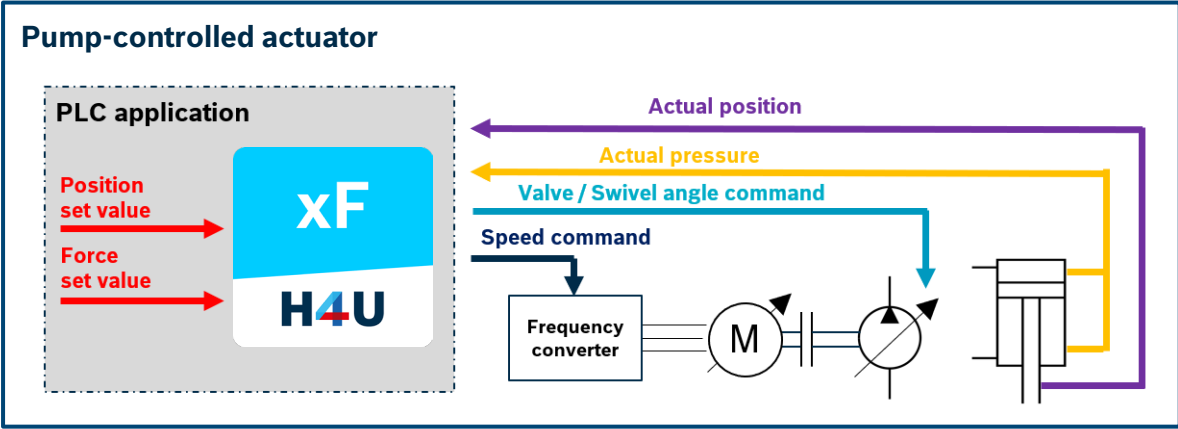
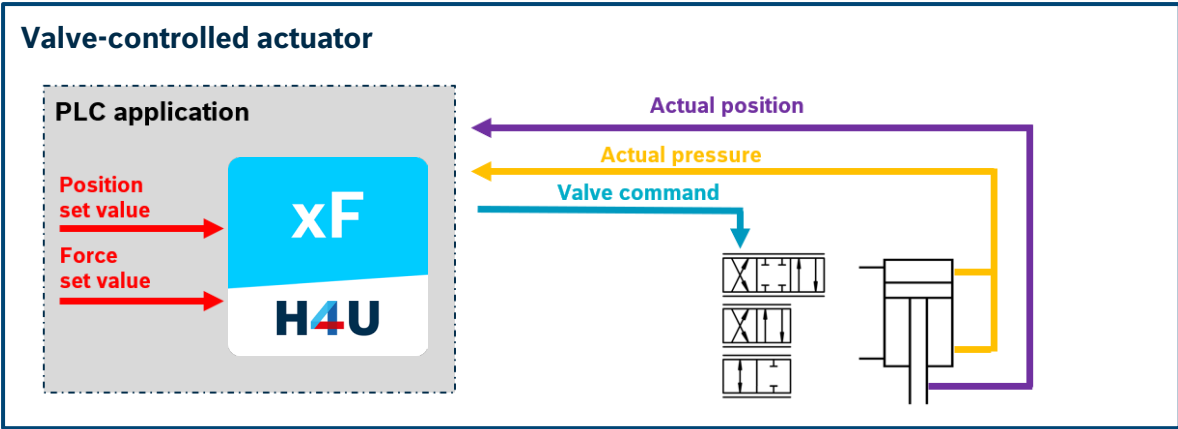
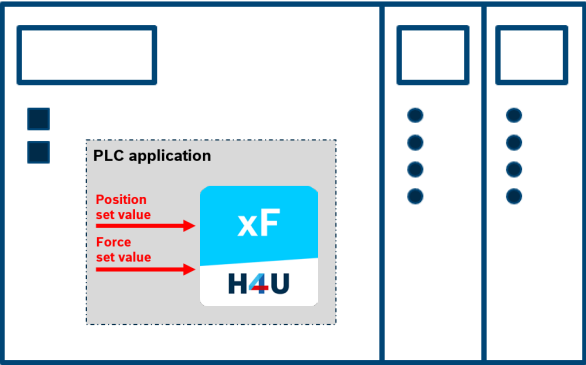
### PLC function blocks for hydraulic control functions



p/Q: Pressure / Flow Control | x/F: Position / Force Control | n/M: Speed / Torque Control |  
Sync: Synchronization Control | IPO: Interpolation

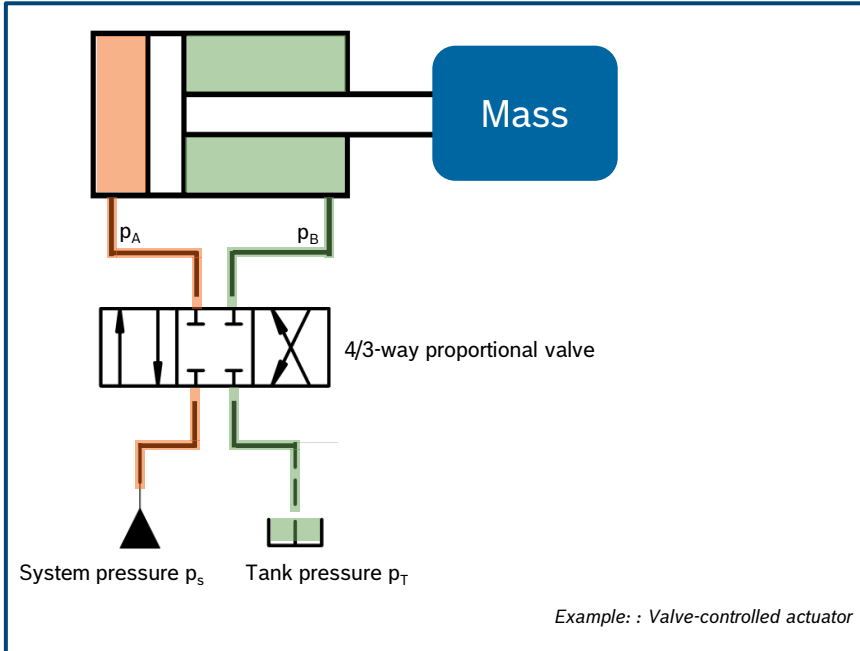
- ✓ For Siemens, Beckhoff and CoDeSys V3 based control systems
- ✓ Uniform functionality in all automation systems
- ✓ Control technology from the global market leader in industrial hydraulics
- ✓ Works perfectly with Bosch Rexroth hydraulic components and systems

# H4U.app Position Force Applications and control concepts



# Motion Control

## Special requirements for hydraulic controller structure



### System

- Direction dependent behavior (Cylinder)
- System pressure dependent
- Velocity dependent
- Depending on weight
- Line length to valve, cylinder
- Non-linear leakage / friction

### Valve

- Valve characteristics (e.g. linear, progressive)
- Valve overlap

### Application

- High position accuracy → mm vs  $\mu\text{m}$
- Velocity of movement → 10.000 mm/s vs 0,1 mm/s
- High force variance → many kN vs few N
- Smooth transition from position control to force control

### Cylinder

- Cylinder length
- Cylinder areas
- Piston or rod side

# H4U.app Position Force

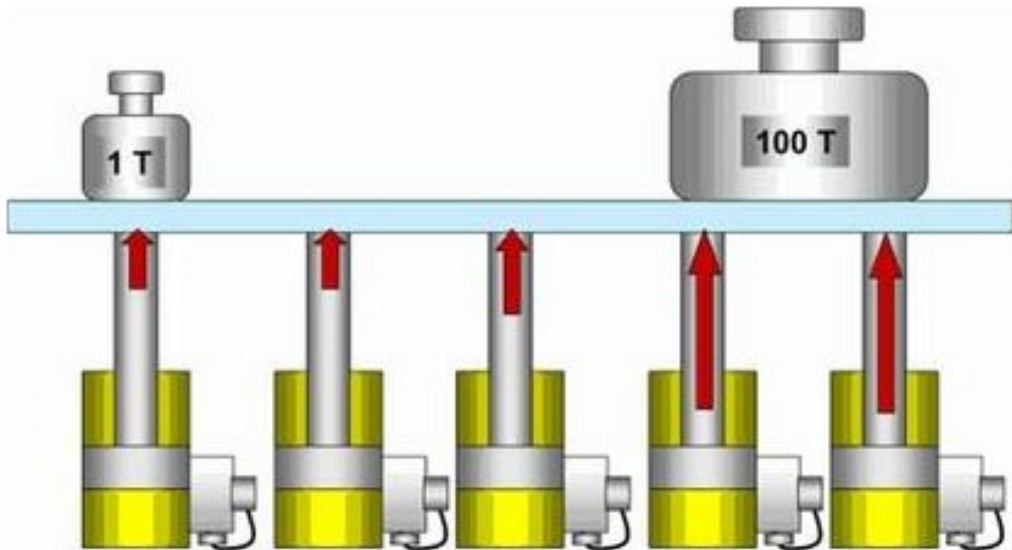
## Technical data



x/F-control		
Position control		✓
Velocity control		✓
Force control		✓
Active damping (State control)		✓
Alternating control (e.g. Position/Force)		✓
Valve direct control		✓
Supported actuator topologies		
Valve controlled actuator	4/3 directional valve	✓
	4/2 directional valve	✓
	2/2 directional valve	✓
Pump controlled actuator	Add./Subtracting transformer	✓
	Serial transformer	✓
	Double rod cylinder	✓

Operation mode control		
Operation limits calculation		✓
Operation mode monitoring		
Internal gear pumps		PGH; PGF
Axial piston pumps		A10VZO; A10FZO
Component database		
Valve controlled actuator	4/3 directional valves	4WRPEH; 4WRLE; 4WRTE
	2/2 directional valve	WRCE
Pump controlled actuator	Internal gear pumps	PGH; PGF
	Axial piston pumps	A10VSO; A10VZO; A10FZO; A4VSO; A4VBO

# H4U.app Synchronization Control Introduction



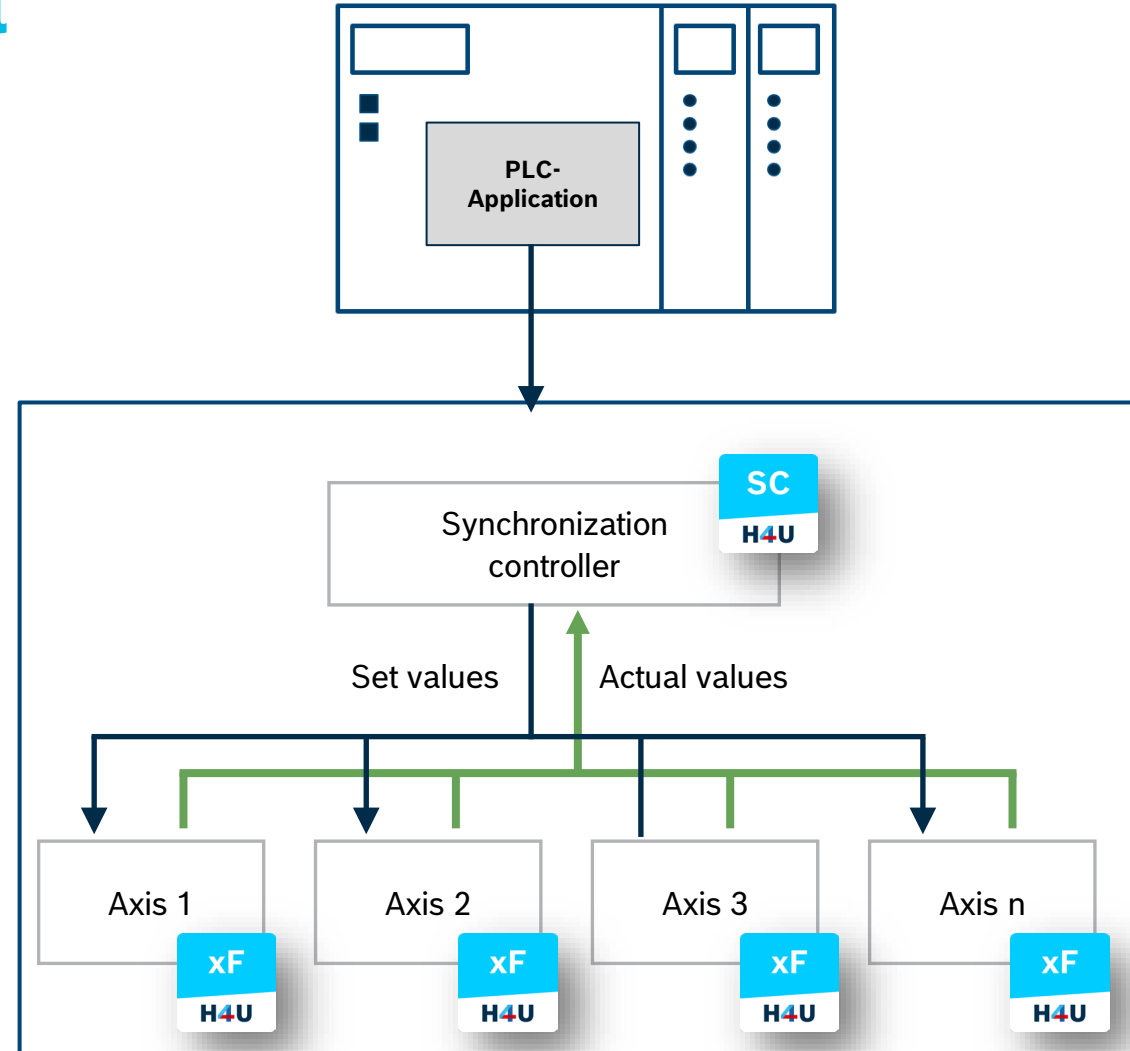
- Synchronized movement of several axes
- Positions of the axes are actively controlled
- Different modes for synchronization control
- Any axis grouping (synchronization group)



# H4U.app Synchronisation Control

## Operating principle

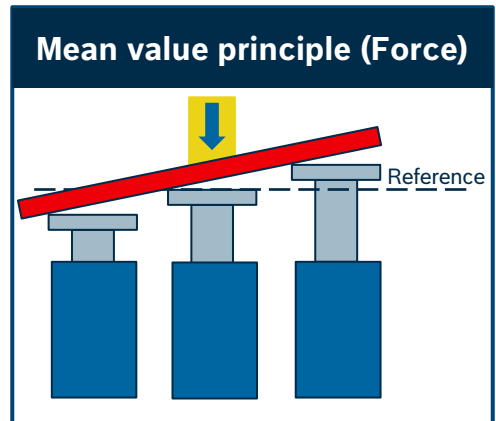
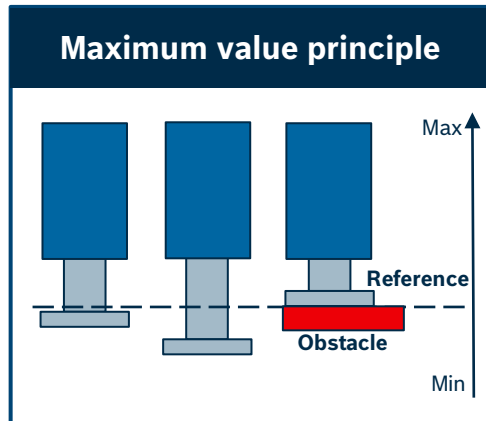
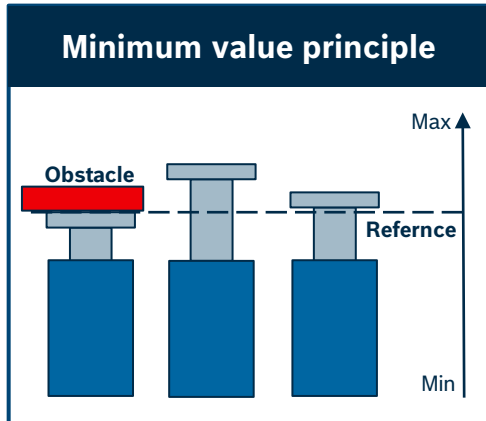
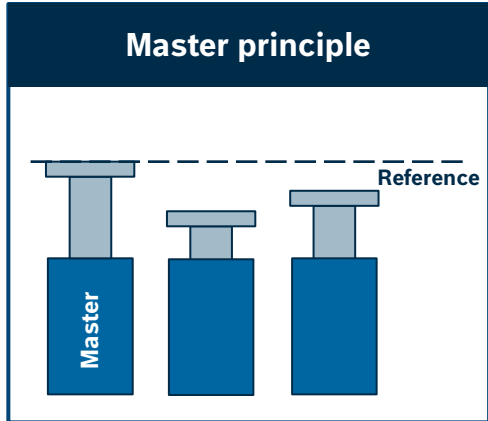
- The synchronization group (axes 1 - n) is commanded via the synchronization controller
- The set values of the slave axes are calculated depending on the selected synchronization mode and the current actual values
- Active synchronization control **minimizes the synchronization error** even with a different load distribution



# H4U.app Synchronisation Control

## Synchronization modes

	Master principle	Minimum value principle	Maximum value principle	Mean value principle (Force)
<b>Description</b>	<ul style="list-style-type: none"> <li>Slave axes follow the master axis</li> </ul>	<ul style="list-style-type: none"> <li>Master axis is the slave axis with the smallest actual position value</li> </ul>	<ul style="list-style-type: none"> <li>Master axis is the slave axis with the largest actual position value</li> </ul>	<ul style="list-style-type: none"> <li>The reference actual value is the mean value of all actual position values of the slave axes</li> <li>Displacement synchronization with force limitation</li> </ul>
<b>Application</b>	<ul style="list-style-type: none"> <li>Leading / Master axis</li> </ul>	<ul style="list-style-type: none"> <li>Elevator</li> <li>Lifting platform</li> </ul>	<ul style="list-style-type: none"> <li>Presses</li> </ul>	<ul style="list-style-type: none"> <li>Parallel holding (presses / displacement)</li> </ul>



# H4U.app Synchronisation Control

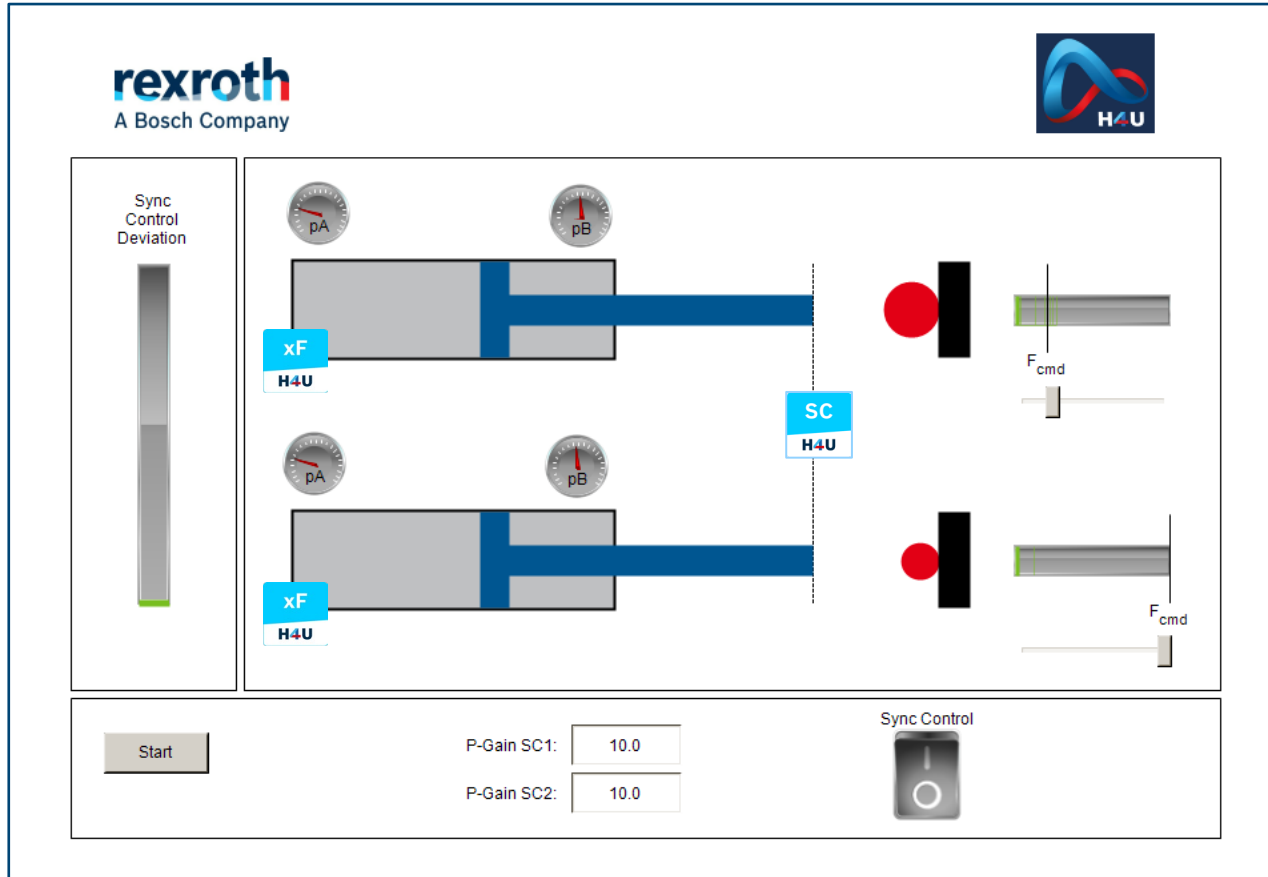
## Technical Data



Synchronization control		
Position control		✓
Target integrator		✓
Velocity control		✓
Force control		✓
Synchronization modes		
<b>Basic:</b> Position / Velocity	Master principle	✓
	Mean value principle	✓
	Maximum value principle	✓
	Minimum value principle	✓
	Following principle	✓
<b>Option 1:</b> Force	Mean value principle With alternating Position / Force control	✓
	Mean value principle With alternating Position / Force control and total force principle	✓

Number of slave axes	
Up to 8	✓
Special functions	
Model error calculation	✓
Break mechanism	✓
Set value correction	✓
Other functions	
Inverted synchronization	✓
Ratio synchronization	✓
Offset synchronization	✓

# H4U.app Position Force & Sync Control Demo Overview



- Two valve-controlled differential cylinders with constant pressure supply in a synchronized system
- Exemplary integration of the Position/Force App (xF) in customer control
- Behavior of the synchronization system with the SyncControl app (SC) and the two Position/Force Apps

# H4U.app Position Force Control xF

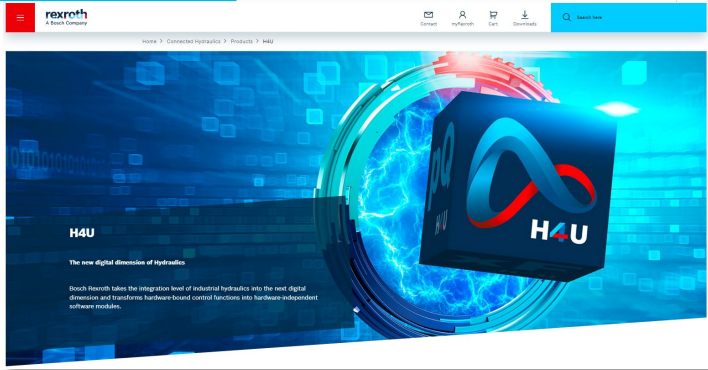
## 6 steps: Integration of the H4U.app xF

- 1 Integrate H4U.app xF into the engineering framework
- 2 Create process signals as global variables
- 3 Create POUs and tasks
- 4 Initialize H4U.app
- 5 Integrate H4U.app into control system
- 6 Optimize overall application & synchronization controller

# H4U – Hydraulics For You

## Further Information

### Website



### Documentation

#### Technical Data Sheet



RE01936

#### Manual



RE01936-FK

#### Quick Start Guide TwinCAT 3



RE01936-01-Z

#### Quick Start Guide TIA Portal



RE01936-02-Z



RE01939



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### Contact Persons



**Florian Zang**

Product Manager Software @ Hydraulics For You



**Thomas Sendelbach**

Product Engineer Software @ Hydraulics For You



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dimension of  
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