Electric Clamping

efficient and ready for serial production.

Electric clamps – no witchcraft involved

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- Electric clamps are no longer innovations
- TÜNKERS has been supplying e-clamps for more than 20 years!

⇨ 2 disadvantages prevented industrial breakthrough

1. Efficiency

   The technically complex concept including motor (servo), reduction gear unit and toggle-joint mechanism, lead to prices of factor 3-5 in comparison with pneumatic clamps.

2. Lack of acceptance of 240/ 400 V – drives by production

   The blanket application of 240/ 400 V clamps is rejected by most plants for safety reasons.

New TÜNKERS electric compact clamp
24 V DC (low voltage)

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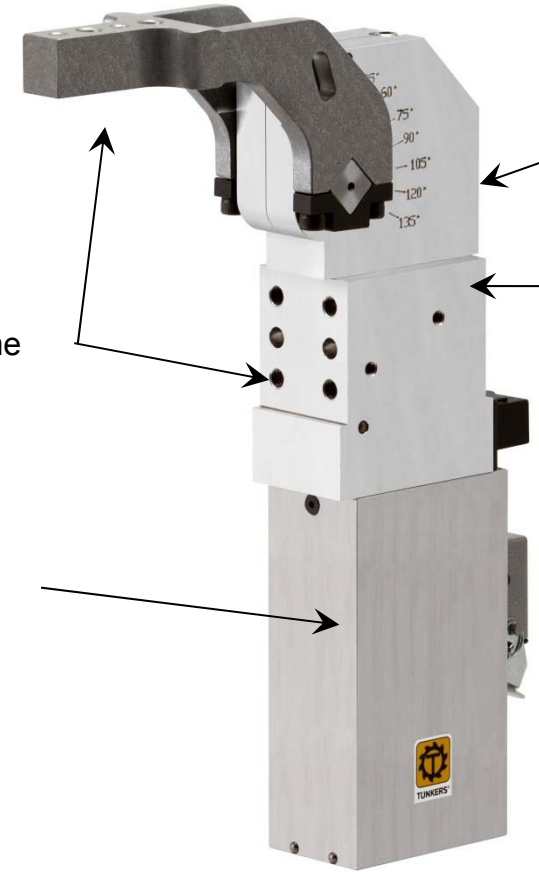


Driven via special spindle / toggle-joint mechanism

Self-locking trapezoid spindle

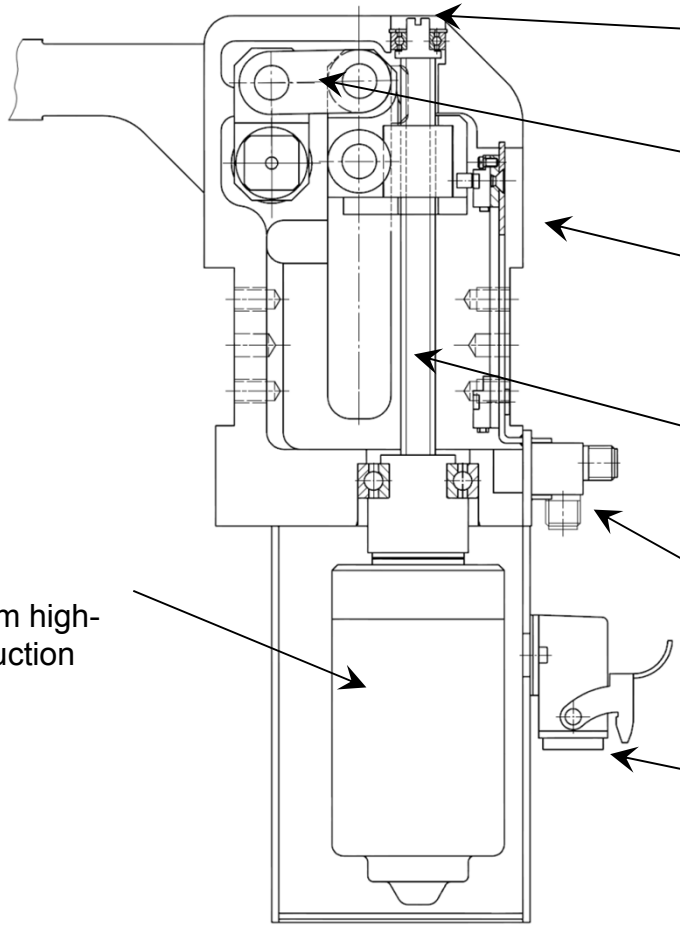
Aluminium housing compatible with the pneumatic series = same arm and housing connection

Standard sensing cartridge T12

24 V DC high-volume motor

Protective aluminium housing with robust 5-pole Harting standardised plug

Principle of electric clamp with DC motor (24 V)



Emergency release in power-free condition

Standard toggle-joint mechanism

Housing compatible with the pneumatic series

Trapezoid spindle for power transmission

Standard DC motor
(24 V DC) originating from high-volume automotive production

Return signals Open/ Closed via T12 sensing system

Central plug for power supply and thermal protection

Serial Vario concept

- The desired opening angle can be set freely via the bottom end switch of the sensing system.
- The self-locking function of the spindle also ensures safe positioning in opened position.

Overview of technical data

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	EK 25	EK 40/40.5	EK 50	EK 63	EK 80
Clamping moment	8 Nm	120 Nm	160 Nm	380 Nm	800 Nm
Holding moment	25 Nm	200 Nm	800 Nm	1500 Nm	2500 Nm
Weight	1,5 kg	3.15 kg	4.2 kg	5.2 kg	-
Length	212 mm	296 mm	315 mm	345 mm	-
Depth	70 mm	127 mm	130 mm	140 mm	-
Width	52 mm	50 mm	60 mm	70 mm	-

Features:
E-clamp with 24 V DC drive

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- 24 V DC voltage is already used by automotive plants for control and sensing technology
- Low voltage – Safe operator protection!
- Broad and cost-effective range of very compact motors of different manufacturers on the market
- Only the energy that is actually needed is consumed. Maintanance of voltage is not required during standstill.
- Energy consumption is subject to loads. More energy can be saved by optimising the weight of the clamping point

- Additional 24 V net required (transformers and decentralised supply)
- High currents ⇨ limited cable lengths, large cross-sections and central power supply

Conventional control concept
Electric clamps

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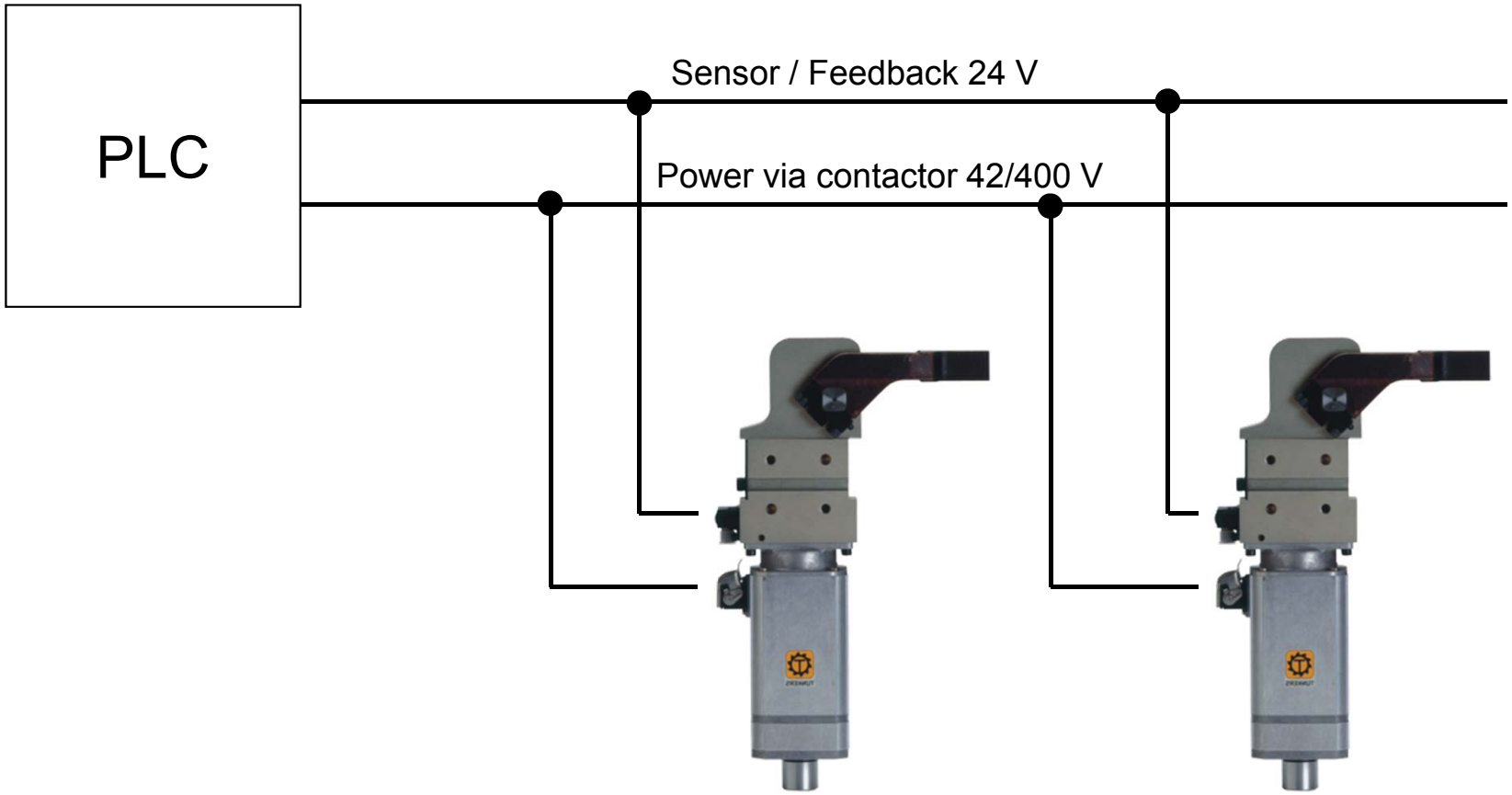

Concept for decentralised control unit

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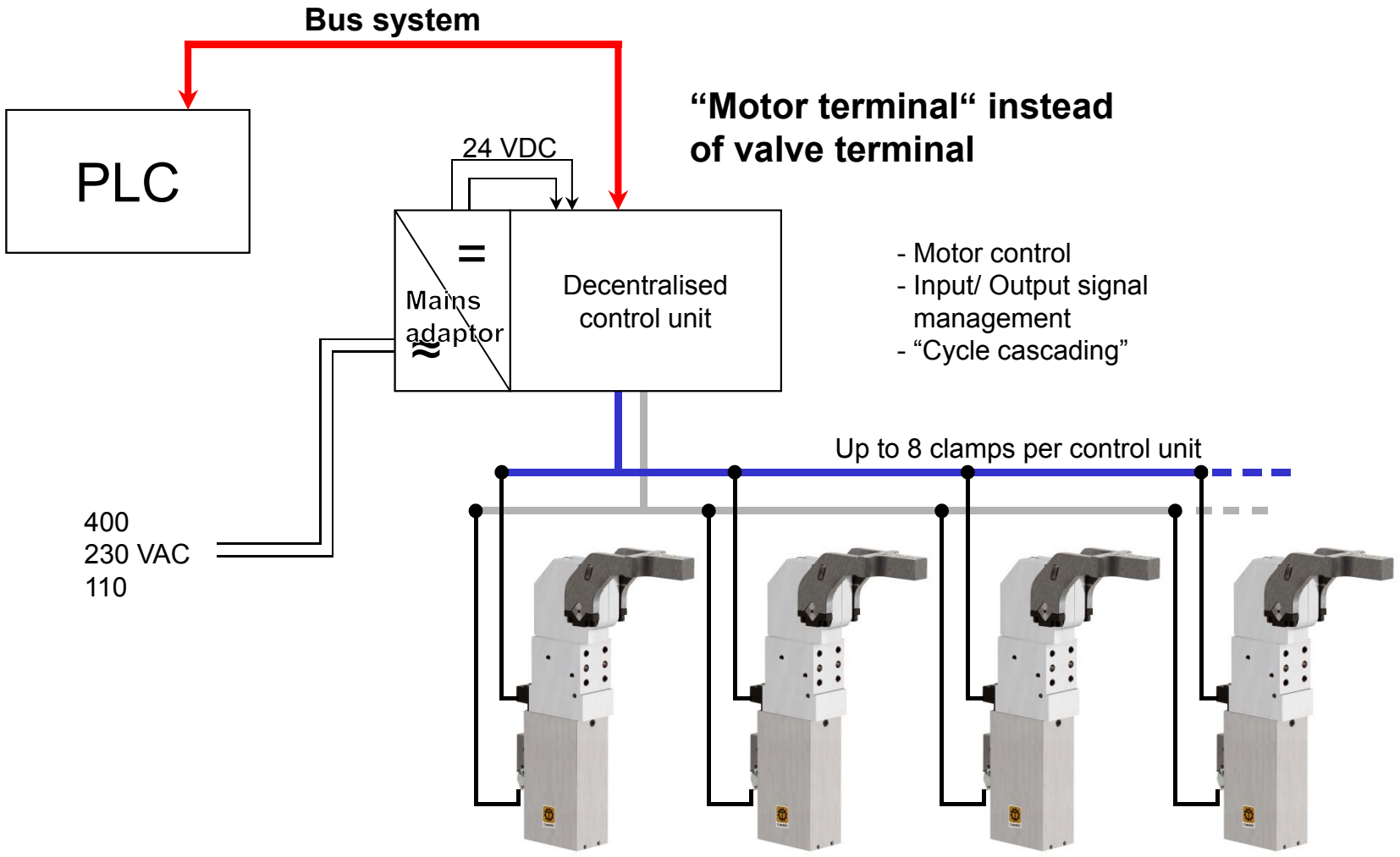

“Motor terminal“ instead of valve terminal

- Motor control
- Input/ Output signal management
- “Cycle cascading”

Motor terminal TMI8
Control unit for up to 8 clamps

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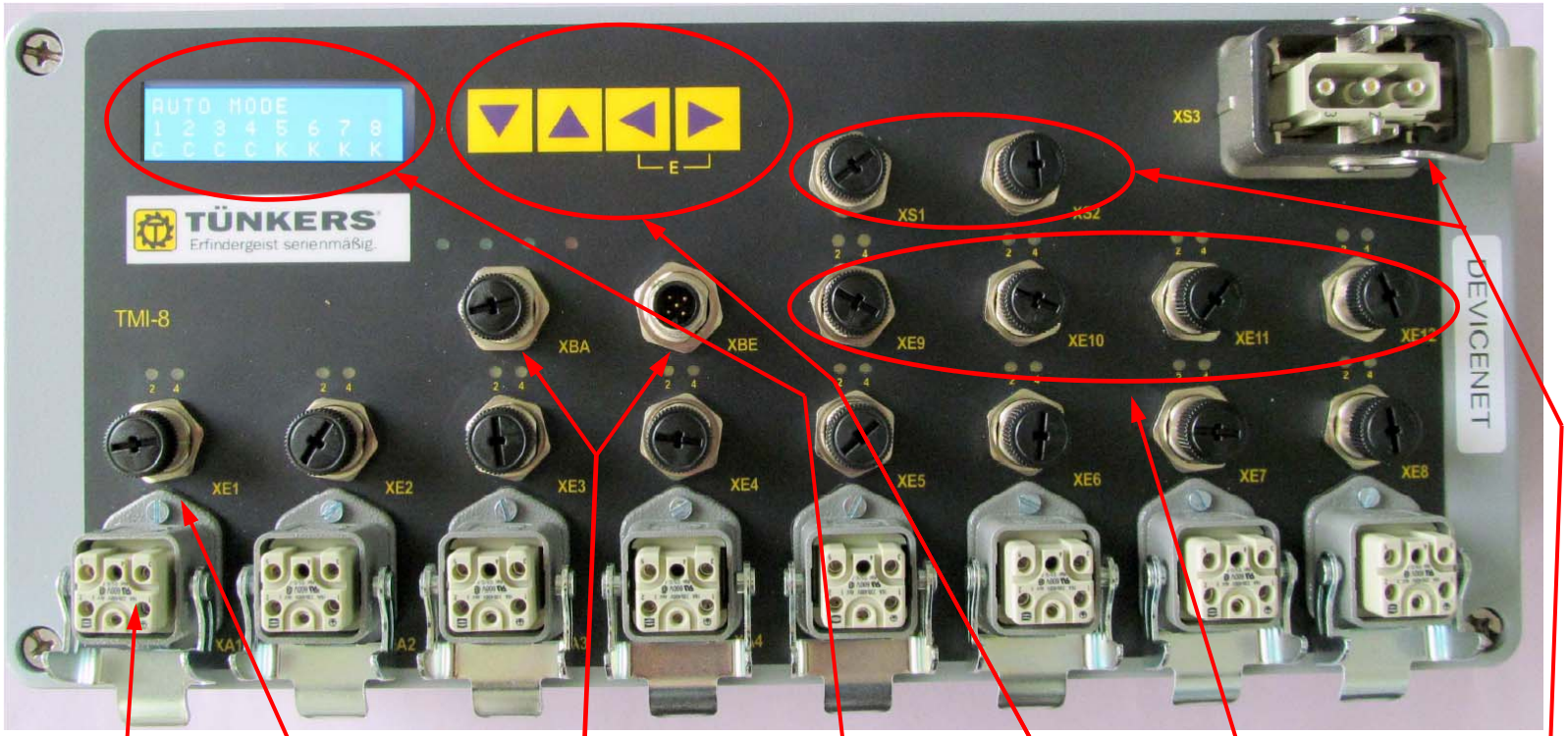
View of the new motor terminal TMI8



Power connection E-clamp

Sensing E-clamp

Bus connection IN / OUT

Info display

Menu keys

additional digital inlets

Supply 24 VDC for sensing unit + motor

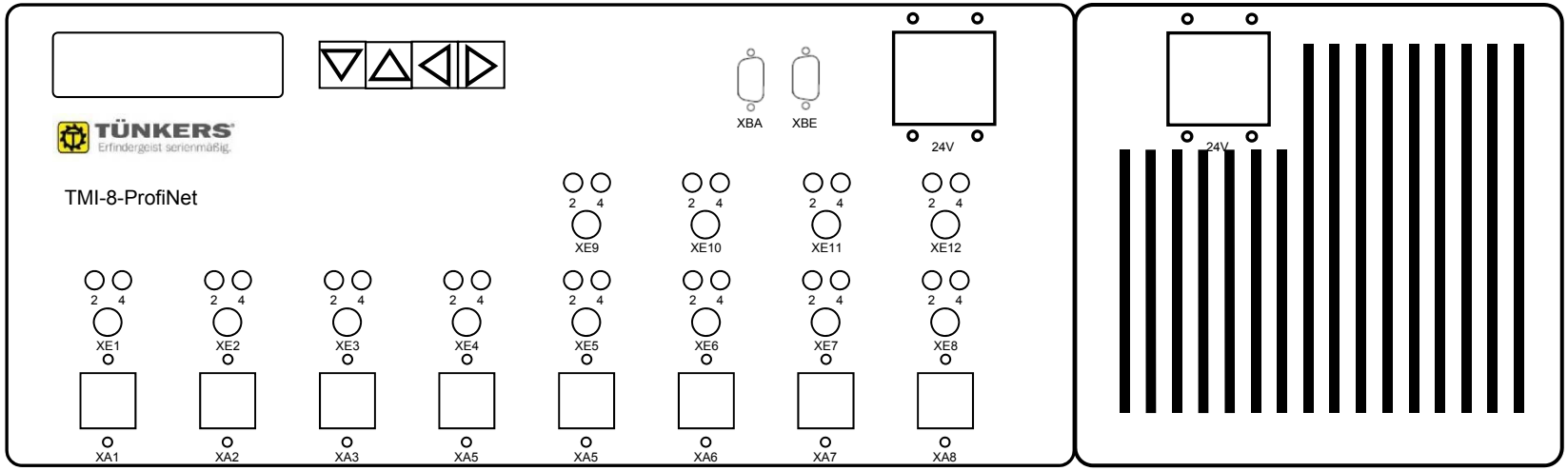
Motor terminal TMI8

- Power supply for 8 clamps (engine performance and sensor)
- Integrated bus interface (Profi-Bus, Profi-Net, Ethernet, IP, etc.)
- Moving single electric clamps or groups,
- Motor island provides the tact cascading to prevent voltage peaks of the engines independently of the PLC
- Control and feedback of e-clamp position to higher-level PLC
- The CPU is relieved and the positioning is done in a timely manner without influence of the CPU cycle time.
- Display for status of the e-clamp
- Preselection and control (open / close) of the clamp with arrow keys
- 4 additional M12 connectors for up to 8 additional initiators or photocells

View Motor terminal TMI8 (version M23-con.)

Motor terminal with upstream power supply unit

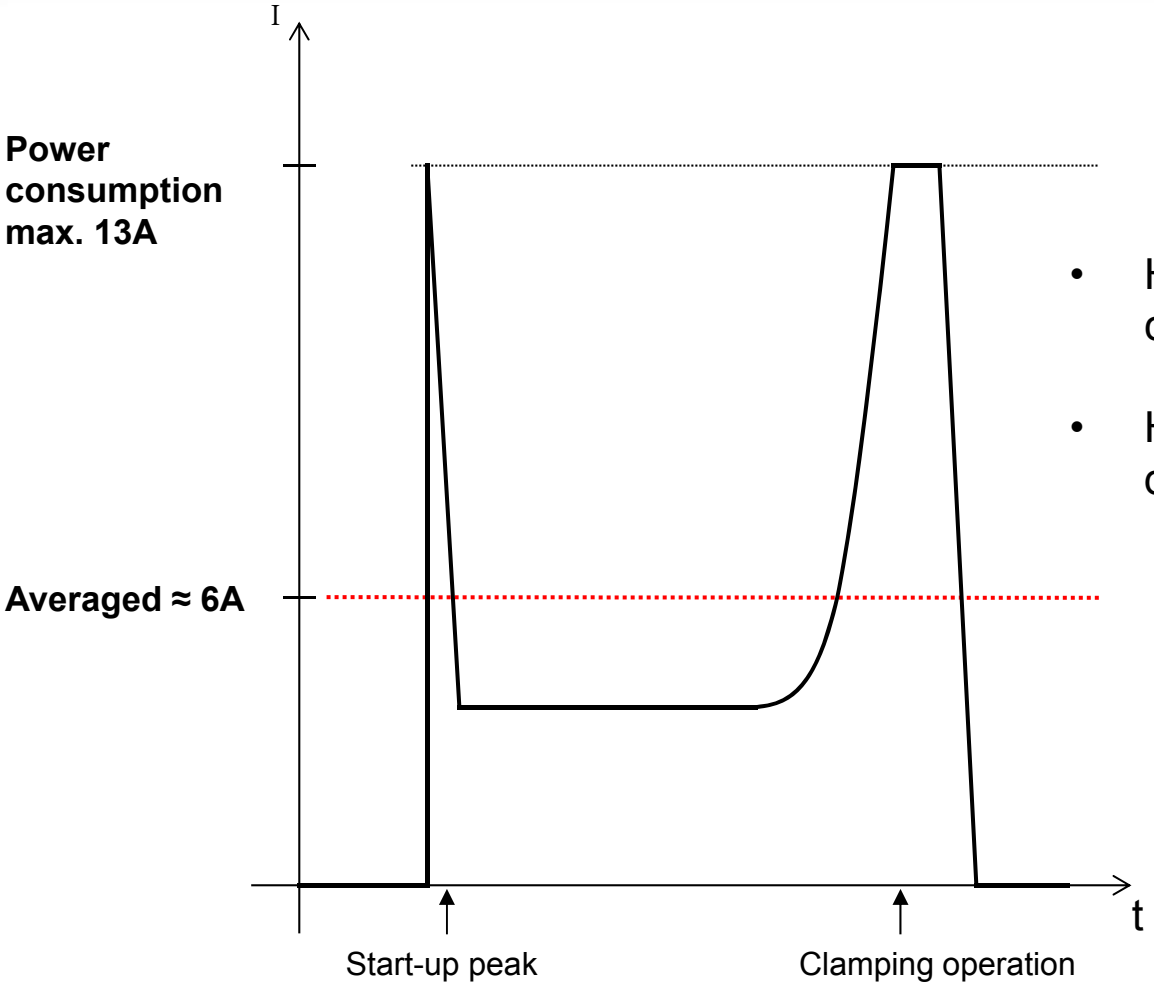
- The power supply of each motor terminal is safeguarded by a power supply unit.
- The input voltage is adjusted to the customer‘s grid.
- As an encapsulated version needs to be offered as well, electrochemical double layer capacitors are used because currents of 8 x 6 A are to be realised.
- The housing dimensions fit harmonically into the overall design of the motor terminal.



Motor terminal

Power supply unit

Power consumption of an electric clamp (here EK 50.1)



- High momentary power consumption during start-up
- High power consumption during closing / clamping

“Motor terminal“ — Manager of power consumption

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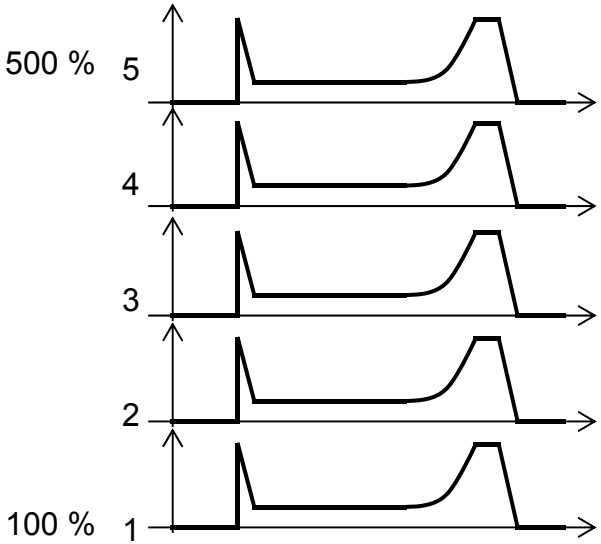
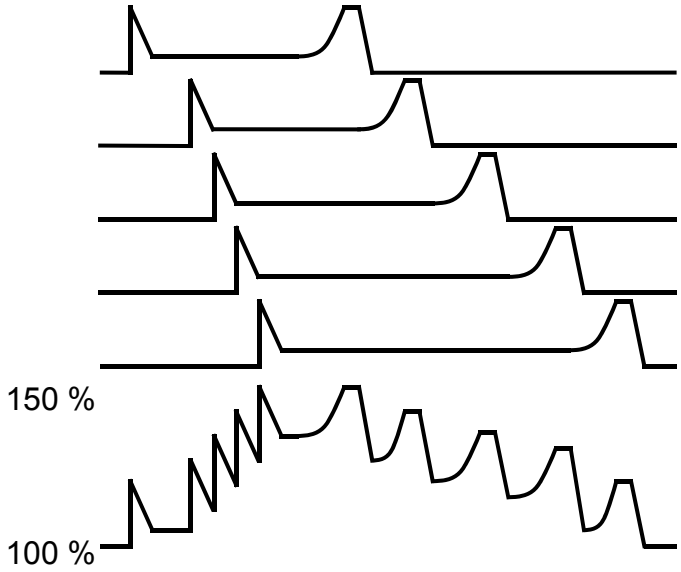
A. Theoretical overlap of power consumption, e.g. when 5 clamps are purely operated in parallel



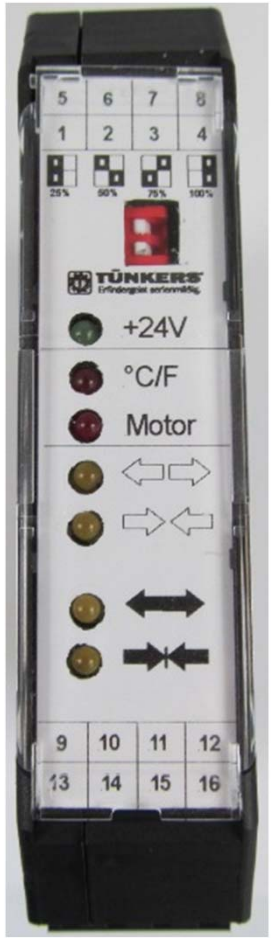
⇨ High net/ transformer output
⇨ 5-fold power consumption in total!

B. Cycle cascading through intelligent clamp control via “motor terminal“



⇨ Low net/ transformer output
⇨ 1.5-fold power consumption in total

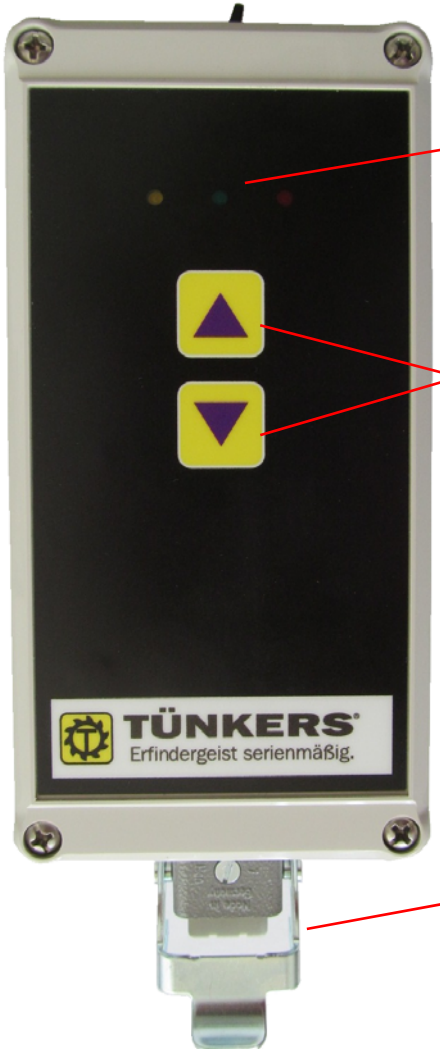
Additional control variants (1/2)
Control cabinet module TSM1



- Control cabinet module for Opening and Closing an Electrical Clamp
- Integrated H-bridge to gear the motor in both directions
- Housing compatible for control cabinet
- DIP switch to approach the movement speed in 4 steps
- Front LEDs

LED grün	+24V	Power supply available
LED rot	°C/F	Overheated motor
LED rot	Motor	Error outlet
LED gelb	⇦⇨	Opening
LED gelb	⇨⇦	Closing
LED gelb	⇔	Opened
LED gelb	⇥⇤	Closed

Additional control variants (2/2)
Hand-held control



Status LEDs

Hold-to-run control
OPEN/CLOSE

Connection for the power supply of an electrical clamp

- Driving an electric clamp on handheld with integrated 24V battery for direct power supply of the clamp
- Tip operation and reduced speed for easy setup process

Energy and cost comparison
Example: Fixture with 10 size-50 clamps

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Size 50 series; 135° opening angle	Vario series		Electric clamp	
	Single clamp	Fixture	Single clamp	Fixture
Energy consumption (at 6 bar)	[l]	[l]	[kWh]	[kWh]
Energy consumption (l or kWh) (cycle)	1,71	17,10	0,00003	0,0003
Energy consumption (cycle) clamping point incl. compressed-air supply hose (3m) » 1,8 l	3,52	35,20		
Energy consumption (0,13 kWh/m³)	[kWh]	[kWh]	[kWh]	[kWh]
per day (1,000 cycles / day):	0,46	4,58	0,03	0,30
per year (250 days):	114	1.144	7,50	75
In the project (8 years):	915	9.151	60	600
CO2 consumption (600 g/kWh)	[kg]	[kg]	[kg]	[kg]
per day (1,000 cycles / day):	0,27	2,75	0,02	0,18
per year (250 days):	69	686	4,5	45
In the project (8 years):	549	5.491	36	360
Operating costs (1,43 ct/m³ – 11 ct/kWh)	[€]	[€]	[€]	[€]
per day (1,000 cycles / day):	0,050 €	0,50 €	0,003 €	0,03 €
per year (250 days):	12,58 €	125,82 €	0,83 €	8,25 €
In the project (8 years):	100,66 €	1.006,59 €	6,60 €	66,00 €

In terms of operating costs the electric clamp beats its pneumatic counterpart by the factor **15**

Thank you for your attention.

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