

samos[®] PRO MOTION

SAFE MOTION

Safe Speed, Direction and Position Monitoring
for Machines and Plants.



SAMOS[®] PRO COMPACT MOTION MOTION LIBRARY.

Integrated + programmable + intuitive.

SAFE STANDSTILL
MONITORING



SAFE
DIRECTION



SAFE SPEED
RANGE



SAFELY LIMITED
SPEED



SAFE SPEED
MONITORING



SAFELY LIMITED
POSITION



- samos[®] PRO COMPACT MOTION**
- + Motion in basic module
 - + Industrial Ethernet on board
 - + Fast inputs of up to 70 kHz



HTL INCREMENTAL ENCODER

- Highest safety level up to SIL3/PLe
- Simple and reliable operation
- Comfortable mounting without toothed wheel



INITIATORS

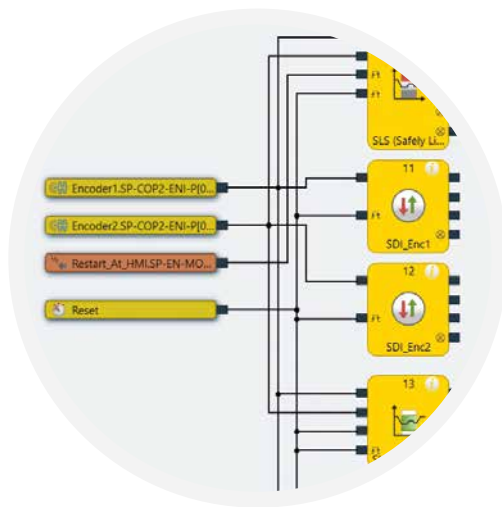
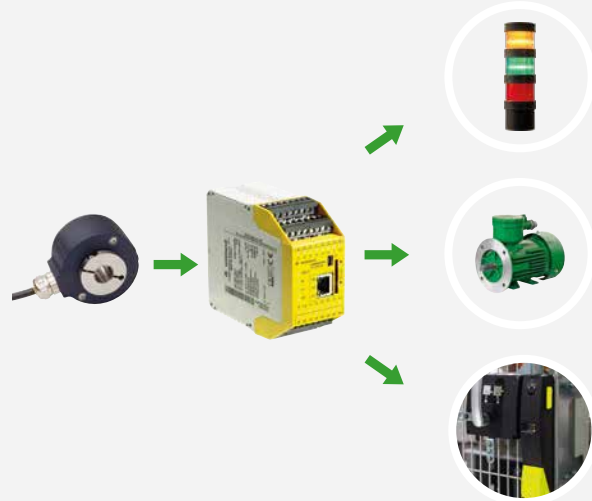
- Monitoring of 2 Axes up to PLd
- Scalable for single and multiple axes
- Cost effective installation for retrofit



FUNCTION OVERVIEW.

WHAT IS SAFE MOTION MONITORING?

- Motion sensors provides pulses during movement
- samos® PRO COMPACT MOTION converts pulses to speed, angle, position and direction
- Motion functions compare current values with limits
- Functions are defined in EN 61800-5-2
- If an allowed limit or range is exceeded
 - Motor can be stopped safely
 - Doors can be locked or unlocked
 - An alarm can be activated

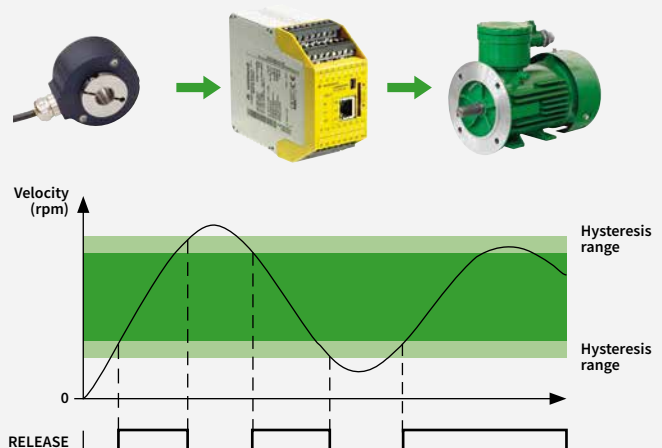


UP TO 100 SPEED OR POSITION RANGES WITH ONE BASIC MODULE

- One sensor input used for many functions
- Flexible units for limits (SSI or North American)
- Each motion function block monitors up to 4 limits
- Up to 25 speed monitoring functions in a module

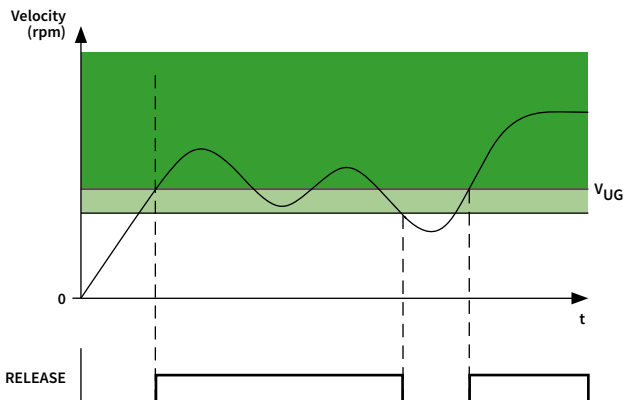
ADJUSTABLE HYSTERESIS AGAINST OSCILLATIONS

- Oscillations of speed or position is very normal
- Especially asynchronous motors regulated weakly
- Solution: Configurable hysteresis for each range
- Release goes to HIGH if value enters inner zone
- Release goes to LOW if value exits the outer zone
- No frequent switching at oscillation points



PROFESSIONAL DIAGNOSTICS AND RESET

- Each motion function offers comfortable reset:
 - Reset input to acknowledge errors
 - Reset required output to inform that errors are solved
- Blinking of Reset Required can be configured
- Error outputs can be shown optionally:
 - Error: Lump sum error output
 - Sensor Related Errors: Stuck-At-Low, Stuck-At-High, etc.
 - Function Related Errors: Discrepancy of two sensors, etc.
- Easy visualisation on lamps, HMI ECO panels and PLCs!

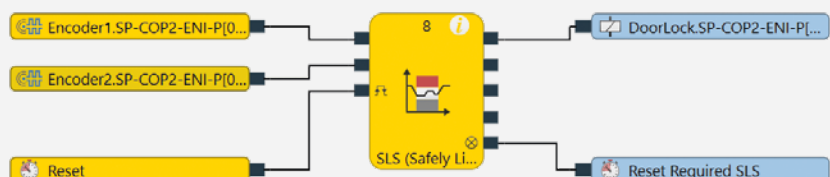


SMOOTH PEAKS WITH SAMPLING INTERVAL

- Measuring interval affects:
 - Reaction time
 - System behaviour with peaks
 - Measurement accuracy
- Short measuring intervals allow a faster response time, short peaks are not filtered
- Long measuring intervals cause longer reaction time, integrated filter reduce short peaks
- Automatic calculation of measuring accuracy by samos® PLAN 6

SPEED COMPARISON FOR BROKEN SHAFT DETECTION

- Scaling factors to synchronise two sensors
- Flexible comparison methods of two motion sensors
- Optional comparison with or without direction
- Configurable time to tolerate peaks
- Configurable results like max, average, difference etc.

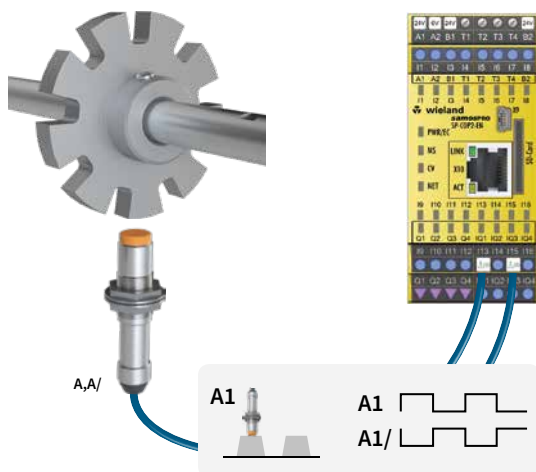
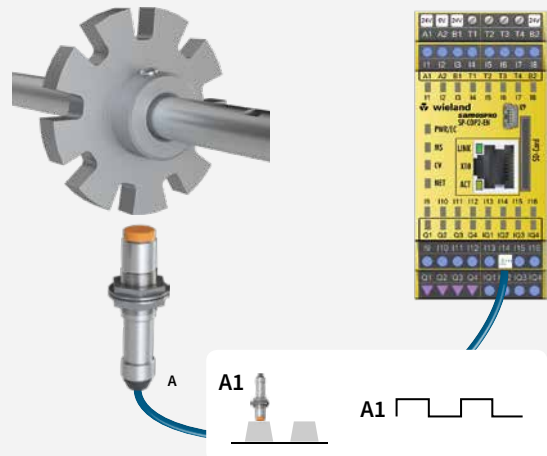




SENSORS AND SAFETY LEVELS.

PROXIMITY SENSOR – TRACK A

- Standard sensor, single channel
- Sensor output must be PNP
- Toothed gear with any pulse ratio (ideal 1:1)
- Typically 3-wire sensors
- Up to 2 axes with 1 samos® PRO COMPACT MOTION
- Maximal reachable safety level for monitoring:
 - Speed: Cat1, PLc, SIL1
 - Position and Direction: not applicable

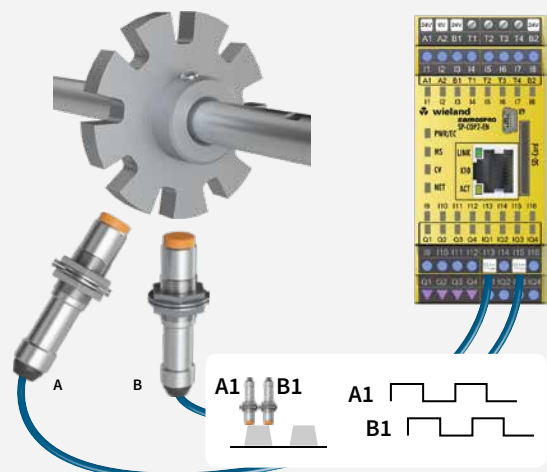


PROXIMITY SENSOR, ANTIVALENT – TRACKS A, A/

- Standard sensor, antivalent (NO/NC)
- Sensor output must be PNP
- Toothed gear with any pulse ratio (ideal 1:1)
- Typically 4-wire sensors
- Up to 2 axes with 1 samos® PRO COMPACT MOTION
- Maximal reachable safety level for monitoring:
 - Speed: Cat2, PLc, SIL2
 - Position and Direction: not applicable

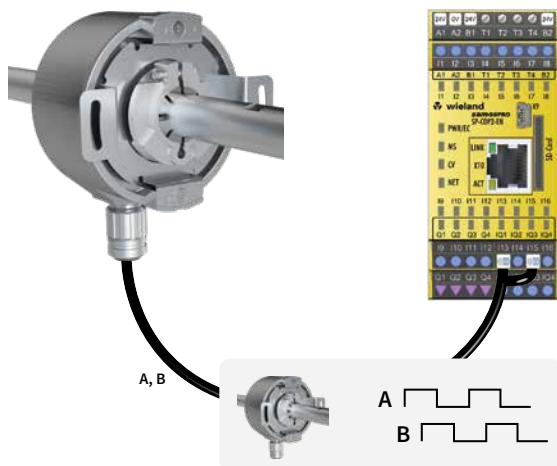
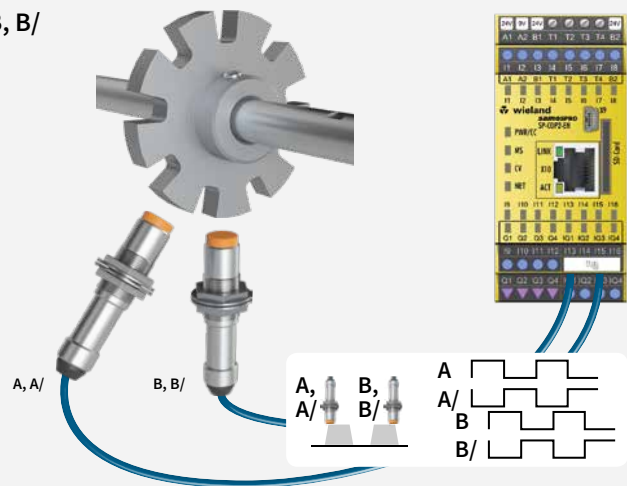
2 PROXIMITY SENSORS – TRACKS A, B

- 2 standard sensors, single channel
- Sensor output must be PNP
- Toothed gear with any pulse ratio (ideal 1:1)
- Flexible phase shift (ideal 90°)
- Typically 3-wire sensors
- Up to 2 axes with 1 samos® PRO COMPACT MOTION
- Distanced inputs against cross short circuit
- Maximal reachable safety level for monitoring:
 - Speed: Cat2, PLd, SIL2
 - Position and Direction: Cat1, PLc, SIL1



2 PROXIMITY SENSORS, ANTIVALENT – TRACKS A, A/, B, B/

- 2 standard sensors, antivalent
- Sensor output must be PNP
- Toothed gear with any pulse ratio (ideal 1:1)
- Flexible phase shift (ideal 90°)
- Typically 4-wire sensors
- 1 axis with 1 samos® PRO COMPACT MOTION
- Maximal reachable safety level for monitoring:
 - Speed: Cat2, PLd, SIL3
 - Position and Direction: Cat2, PLd, SIL3

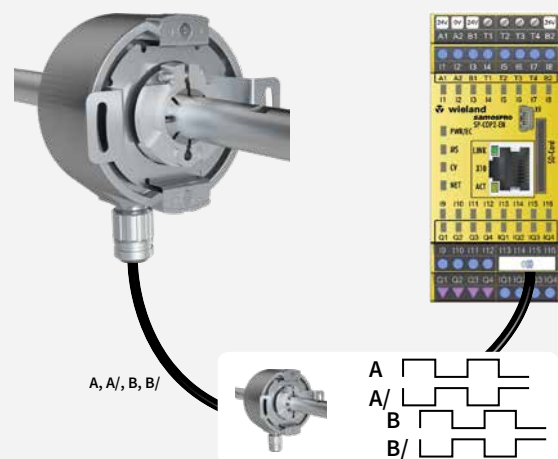


HTL INCREMENTAL ENCODER- SINGLE ENDED

- HTL incremental encoder with 2 tracks
- Desired sensor output is push-pull due to cable break detection
- No extra mechanic necessary
- Typically 6 or 8-wire encoders
- 2 axes with 1 samos® PRO COMPACT MOTION
- Maximal reachable safety level for all functions:
 - Standard Encoders: Cat2, PLd, SIL2 (with additional diagnostic channel)
 - Safe Encoders: Cat2, PLd, SIL2

HTL INCREMENTAL ENCODER, ANTIVALENT

- HTL incremental encoder with 4 tracks
- Desired sensor output is push-pull due to cable break detection
- No extra mechanic necessary
- Typically 8-wire encoders
- Only 1 axis with 1 samos® PRO COMPACT MOTION
- Maximal reachable safety level:
 - Standard Encoders: Cat2, PLd, SIL2 (with additional diagnostic channel)
 - SENC Safe Encoders: Cat4, PLe, SIL3

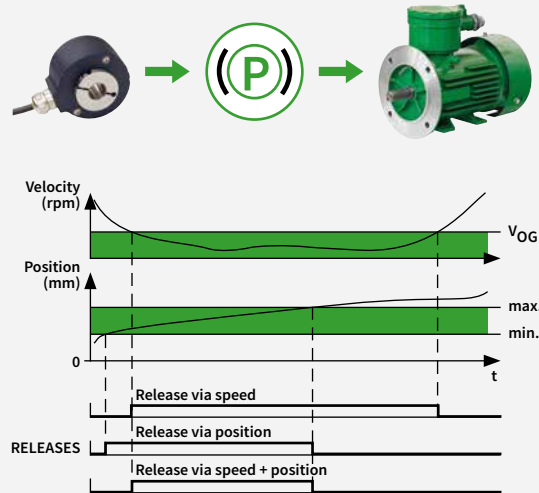




MOTION FUNCTION SAFE STANDSTILL MONITORING

FUNCTIONALITY

- Safe standstill monitoring with position and speed window
- Ensures that axis remains still and does not move
- Different modes for standstill monitoring:
 - Speed window: Speed of axis cannot exceed a limit
 - Position window: Axis cannot move out of position window
 - Combination of speed and position window
- Referencing input for the current standstill position
- Two sensors with speed and position comparison
 - Redundancy to increase safety level
 - Redundancy to increase the availability



APPLICATION FIELDS

- Setup and calibration of machines
- Tool change in CNC Machines and presses
- Service and maintenance of escalators
- Cleaning of machines and plants
- Quality of process in ultrasound welding

YOUR BENEFITS

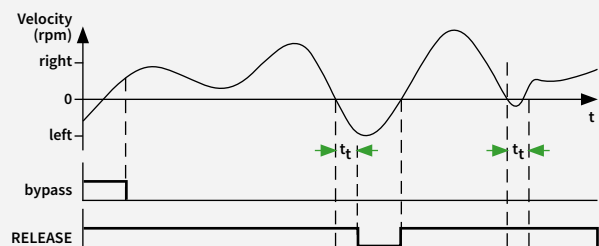
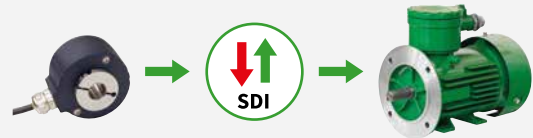
- + Solves problems with vibrations using position window
- + Monitors vertical axes and slowly sliding loads
- + Guarantees process quality with highest safety level



MOTION FUNCTION SAFE DIRECTION

FUNCTIONALITY

- Safe direction monitoring with an allowed direction
- Ensures that drive rotates in selected direction
- Tolerance time against short direction changes



APPLICATION FIELDS

- Safe closing in gate systems
- Safe direction of rollers in printing machines
- Automated guided vehicles (AGVs)
- Muting in upwards direction at presses
- Safe direction in conveyors against motor damage

YOUR BENEFITS

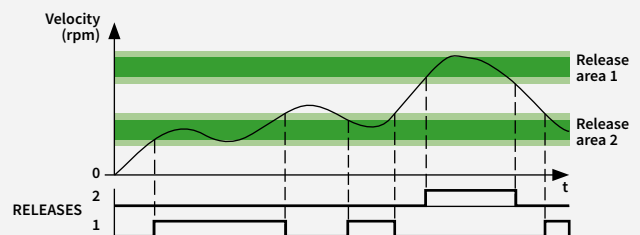
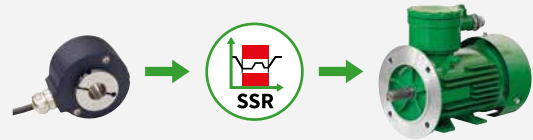
- + Ensures human safety in gate systems
- + Safe setup and maintenance of machines
- + Increases production efficiency in presses
- + Reduces financial damages protecting drives



MOTION FUNCTION SAFE SPEED RANGE

FUNCTIONALITY

- Safe speed monitoring with upper and lower limit
- Ensures that drive runs in a speed range
- Filtering unwanted peaks with sampling interval
- Two sensors with speed comparison for
 - Redundancy to increase safety level
 - Redundancy to increase the availability
 - Broken shaft detection
- Tolerance time against short deviations
- Flexible speed comparison with or without direction

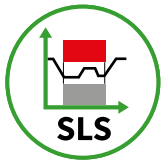


APPLICATION FIELDS

- Zone switching in AGV applications
- Broken shaft monitoring in presses and wind turbines
- Speed range monitoring in pumps
- Air conditioning of critical areas
- Fans for the export of dangerous gases
- Identification of motor blockages

YOUR BENEFITS

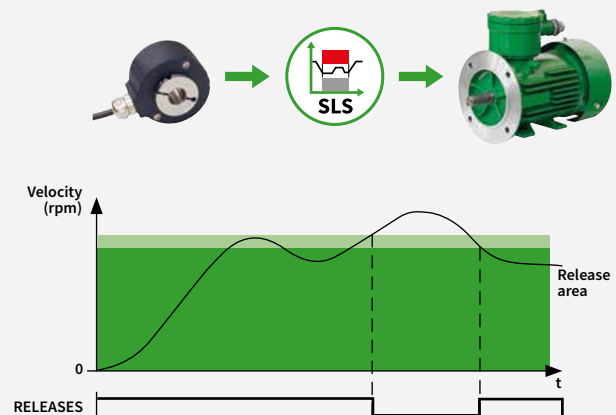
- + Accident free efficiency in intralogistics
- + Ensures human safety due to air conditioning
- + Protects investment due to fluid supply or removal
- + Fullfills safety with broken shaft detection



MOTION FUNCTION SAFELY LIMITED SPEED

FUNCTIONALITY

- Safe Speed monitoring with upper limit
- Ensures that drive does not exceed a speed
- Filtering unwanted peaks with sampling interval
- Two sensors with speed comparison for
 - Redundancy to increase safety level
 - Redundancy to increase the availability
 - Broken shaft detection
- Tolerance time against short deviations
- Flexible speed comparison with or without direction



APPLICATION FIELDS

- Setup and calibration of machines
- Tool change in CNC Machines
- Manual feeding of winder
- Manual teaching of robotics
- Overspeed detection in wind turbines
- Maximum speed monitoring in centrifuges
- Overspeed detection in amusement parks

YOUR BENEFITS

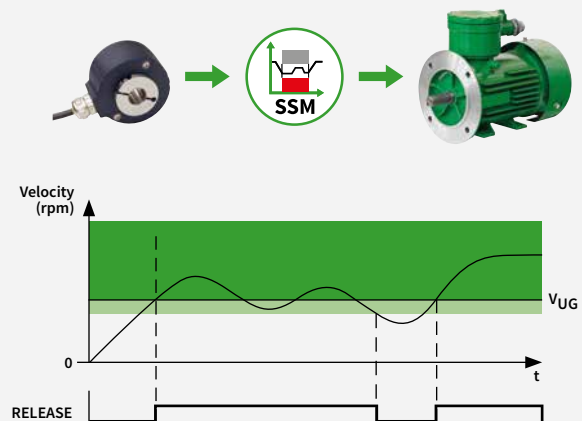
- + Ensures human safety during service and maintenance
- + Continues production allowing human interactions
- + Accelerates setup time of the machine
- + Protects components and high investments



MOTION FUNCTION SAFE SPEED MONITORING

FUNCTIONALITY

- Safe speed monitoring with lower limit
- Ensures that drive runs above a defined speed
- Filtering unwanted peaks with measuring interval
- Two sensors with speed comparison for
 - Redundancy to increase safety level
 - Redundancy to increase the availability
 - Broken shaft detection
- Tolerance time against short deviations
- Flexible speed comparison with or without direction



APPLICATION FIELDS

- Minimal speed monitoring in pumps, fans
- Monitoring of fans for carrying out hazardous gases or for the supply of air
- Minimum speed of laser head in cutting machines
- Quality of production in mixers and breweries

YOUR BENEFITS

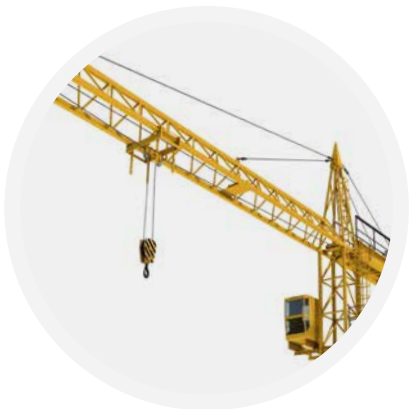
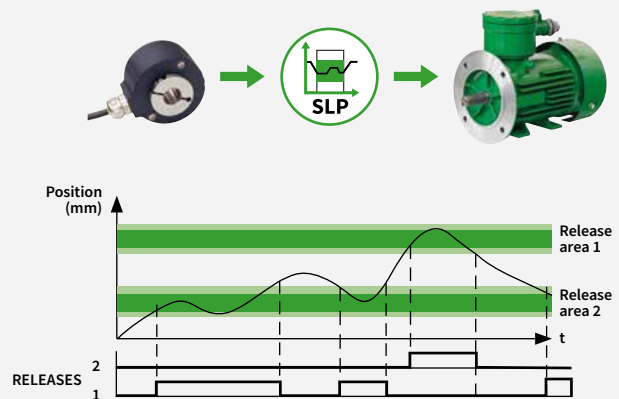
- + Ensures human safety due to air conditioning
- + Protects investments with reliable fluid supply or discharge
- + Guarantees the quality of production
- + Eliminates the need for multiple speed monitors or motion modules



MOTION FUNCTION SAFELY LIMITED POSITION

FUNCTIONALITY

- Safe position monitoring with upper and lower limit
- Ensures that axis remains in permitted position range
- Up to 100 position ranges (CAMs) in one module
- Allowed movement range configurable per samos® PLAN 6
- Easy homing thanks configurable start position
- Modulo option for infinite axes or rotary tables
- Two sensors with position comparison
 - Redundancy to increase safety level
 - Redundancy to increase the availability



APPLICATION FIELDS

- Safe working zone for material feeding and removal
- Working zone for cartesian robotics
- Safe angle range for rotary tables
- Maximal gap between tools in injection moulding machines
- Safe positioning range for cranes

YOUR BENEFITS

- + Human safety in production zones
- + Component protection during setup and operation
- + Production quality for rotary tables
- + Less insurance costs for cranes



SAFE HTL ENCODER SENC.

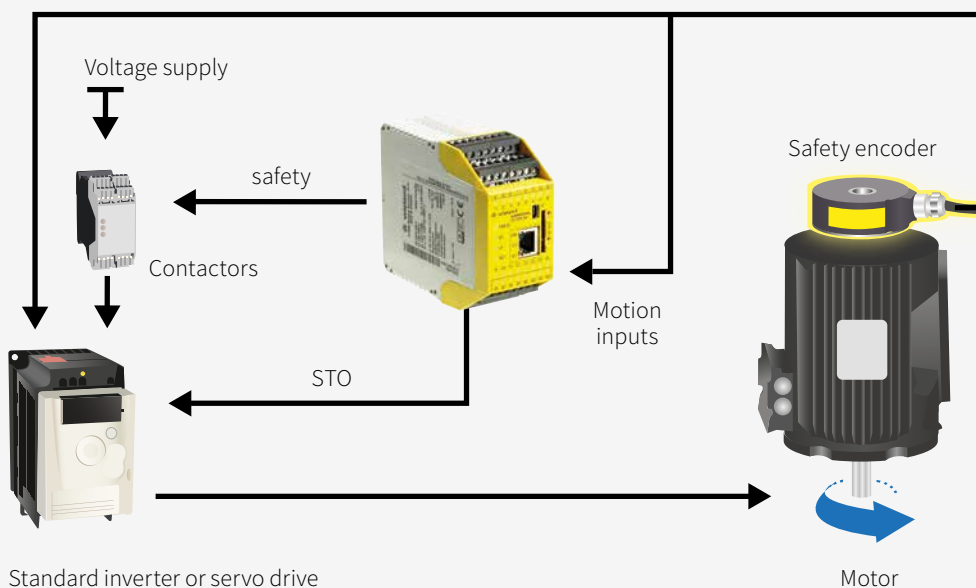
APPLICATIONS FOR SAMOS® PRO COMPACT MOTION

- Safe monitoring of motors, drives or axes
- Safe rotational speed, rotational direction or position monitoring to IEC 61800-5-2
- Standstill monitoring for commissioning or maintenance



FEATURES

- Rotational speed or position monitoring to SIL3 (acc. IEC 61508) and PL_e (acc. EN 13849)
- Special form fit with the positive lock for hollow shafts
- Compact 58 flange size with minimum space requirement inside the machine
- Flexible mounting with hollow shaft, solid shaft or axial connector
- Compatible HTL output for fast safe inputs on samos® PRO COMPACT MOTION
- Resolutions from 360 ppr, 512 ppr and 1024 ppr depending on accuracy requirement
- PUR encoder cable resistant to oil, UV, ozone and solvents
- Over 100,000 hours of service life of ball bearings at hollow shaft encoder
- Maximum peak speed of 9000 rpm and continuous speed of 4000 rpm



SOLUTION FOR MODULAR SAFETY

Safety level:
to SIL3/PL_e



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Further information and a product overview is available here:

SAMOS® PRO COMPACT
Compact safety
Art. No. 0881.1



SAFETY CATALOG
Safe system solutions for automation
Art. No. 0860.1



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