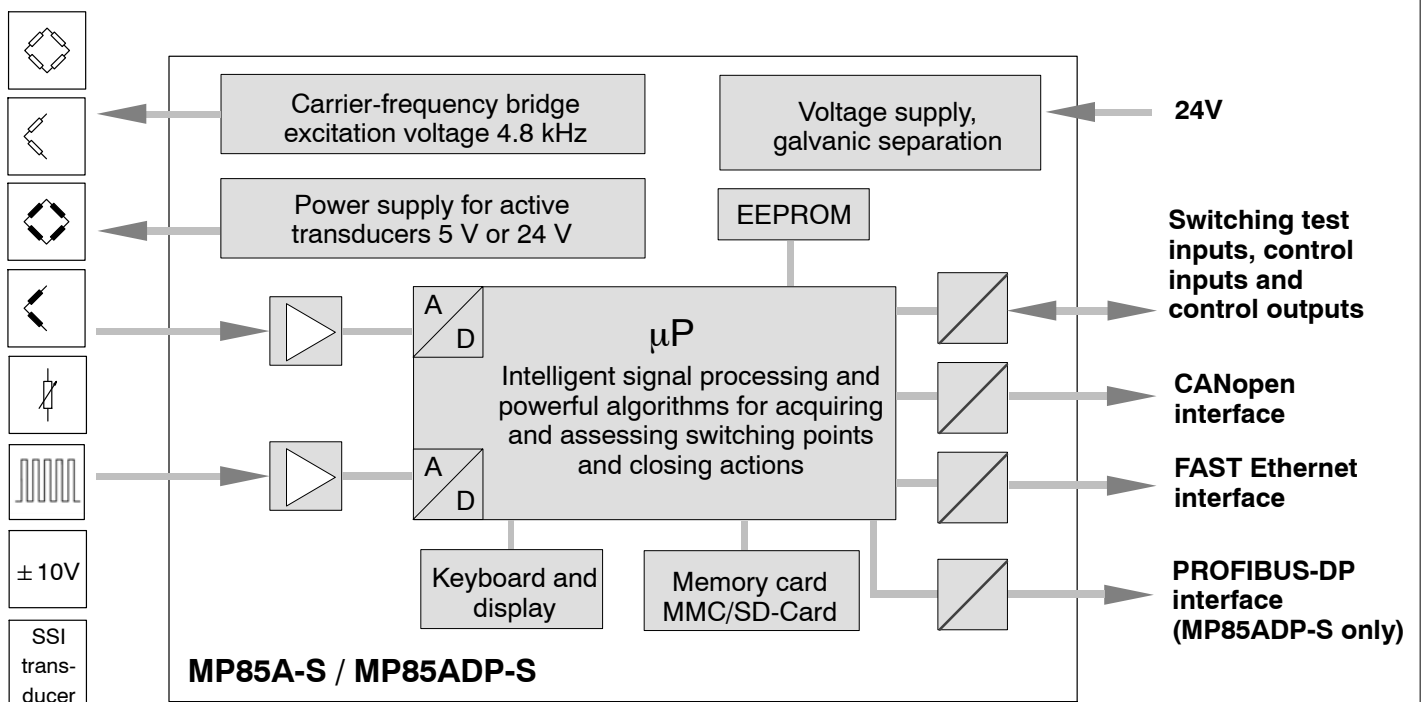


# MP85A-S MP85ADP-S EASYswitch



## Special features

- 100% quality control of the checking process
- Powerful algorithms for acquiring and assessing switching points and closing actions
- Universal twin-channel amplifier for many commercially available sensors with TEDS sensor detection
- Memory function for results, curves and device settings
- Convenient integration into the automation system by means of standardized fieldbus interfaces



## Description

### Switch checking device for production and laboratory

With EASYswitch, the switching characteristics of the switching elements and closing systems are recorded by means of force/displacement or torque/angle of rotation sensors. Tactile feedback when operating push buttons and rotary actuators, as well as the switching characteristics of single pole or multipole voltage switches can be objectified and documented.

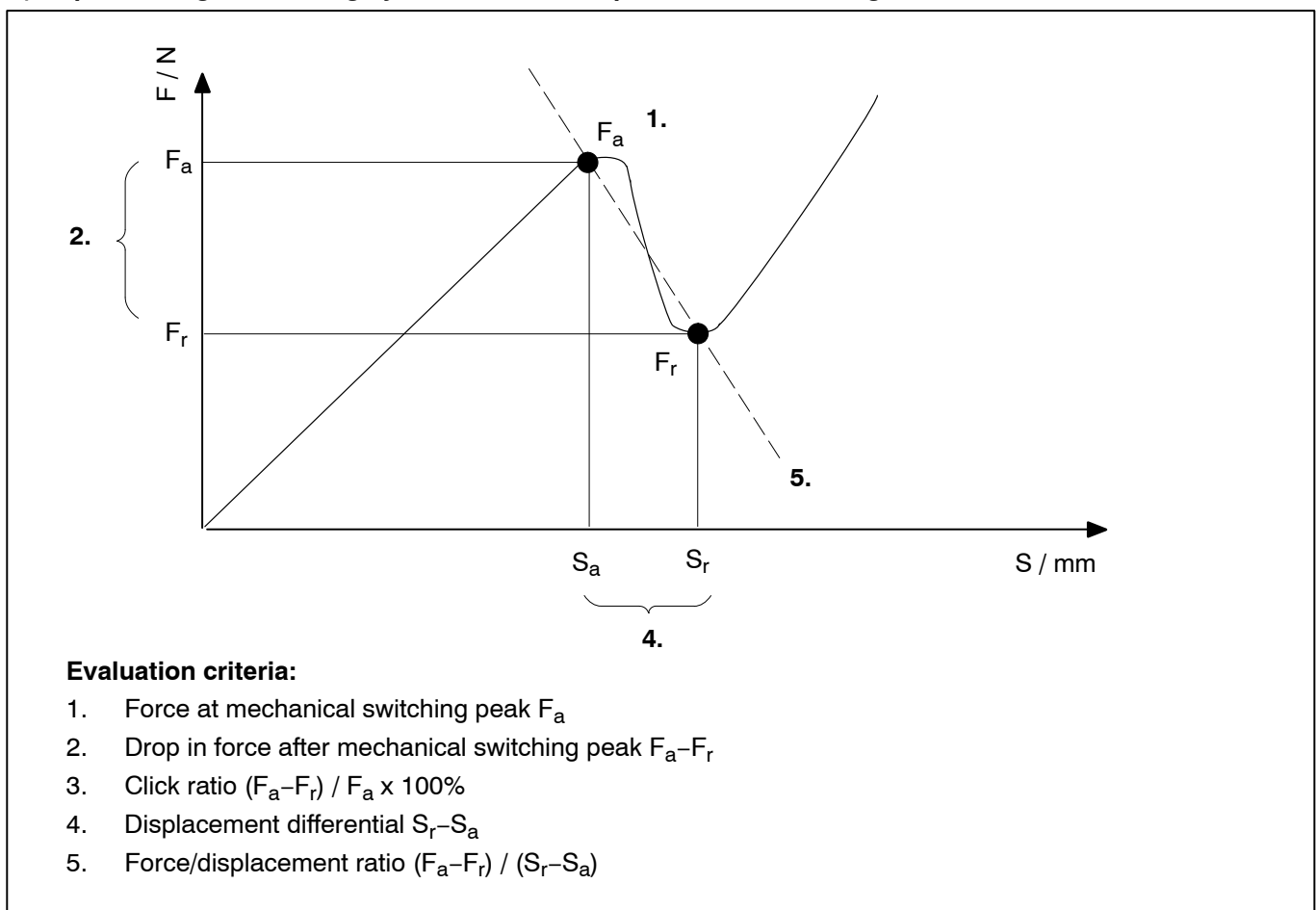
With the MP85A(DP)-S EASYswitch, quality assurance can be integrated into the checking process.

EASYswitch includes all the functions necessary for 100% checking, together with user-friendly, flexible software that allows the user to configure variable test sequences without in-depth programming knowledge.

### Performance features and advantages:

- Simple configuration and commissioning with the free parameterization and visualization software PME Assistant. Download from [www.hbm.com](http://www.hbm.com) -> Support -> Software
- Precise standard-compliant process analysis to meet requirements
- Flexible system for monitoring different workpieces, 1000 different device settings and 1000 different workpieces/processes can be stored
- Storage of results, curves and statistics, as well as the device settings in the device itself on a memory card or external PC
- Continuous traceability thanks to integrated process control and the statistics functions of the stored processes
- Integration via digital inputs/outputs or integrated fieldbus interfaces to primary control systems, such as a PLC control or process control systems
- Flexible application, tailored for use at manual workstations
- Expansion of existing machines and retrofitting of test systems possible

### A) Haptic testing of a closing system via force/displacement monitoring



## B) Switch check of electric switching systems

### Solutions for test functions

Up to 5 switching events can be checked simultaneously or consecutively via the integrated digital inputs or the fieldbus interface (digital transmission of switching events):

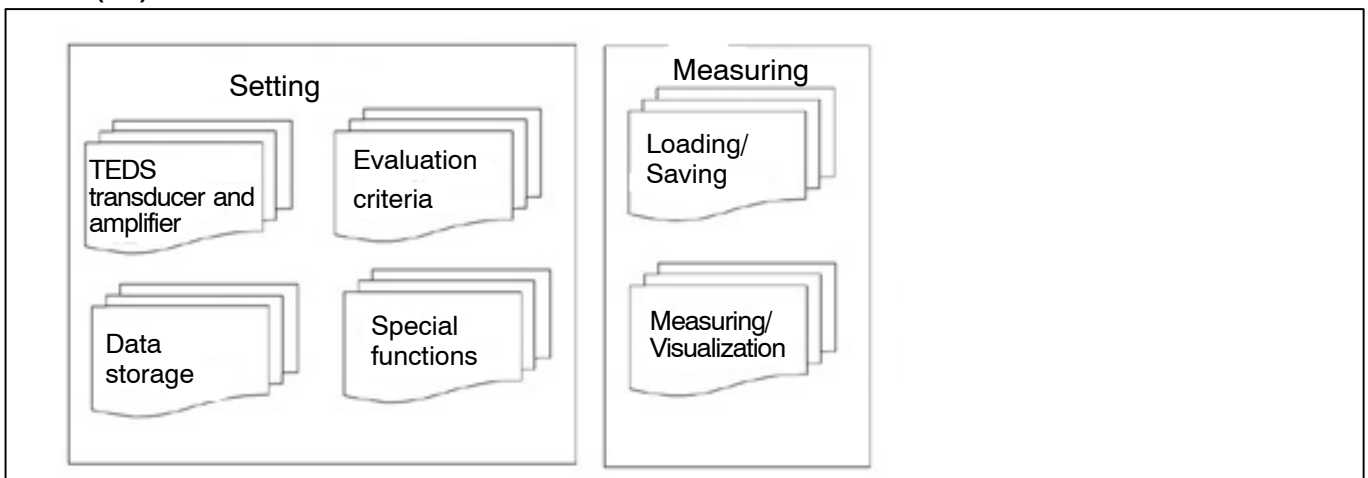
- Is the switching point in the switching test window
- Is the direction of actuation (break/make) correct
- Is the correct actuating force/actuating moment present
- Have switching repetitions occurred

Measurement curves and results are recorded and evaluated online. If one or more conditions not met, an NOK window is displayed.

OK / NOK testing controls production and helps to minimize downtime. Warning limits monitor the production process, making machine protection possible, control signals control Start/Stop. Limit value cutoff implemented either via digital inputs, Ethernet or PROFIBUS-DPV1 interface (optional).

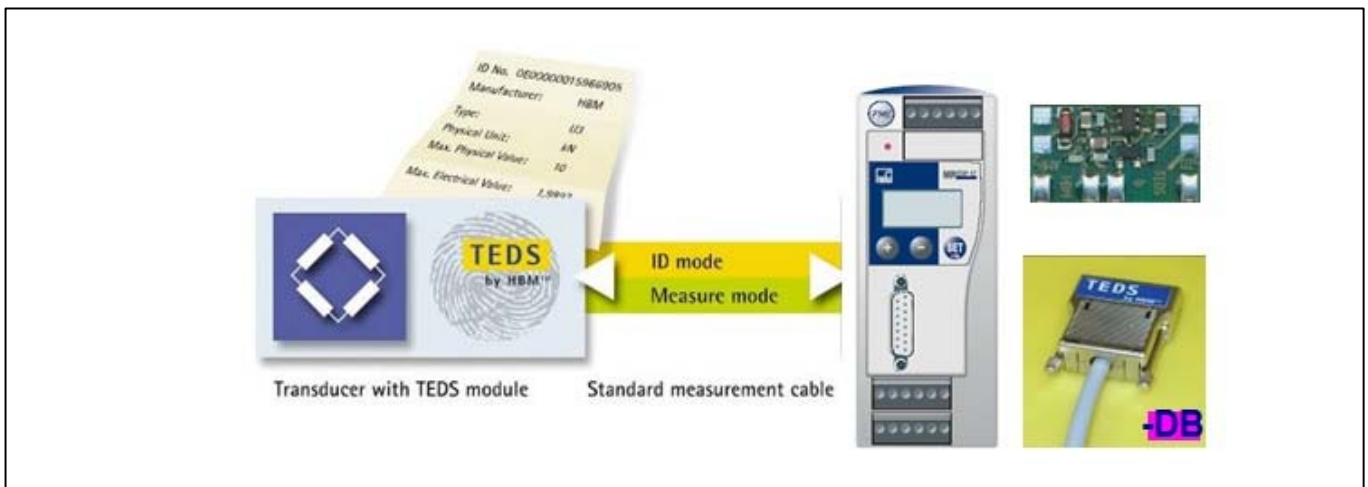
All the individual and cumulative results, switching curves and switching events (break/make function) are stored.

### MP85A(DP)-S EASYswitch function blocks



### Immediate utilization of evaluation criteria

- Sensor data does not need to be set manually when using sensors with TEDS technology
- The TEDS data is read via the sense leads from the sensor (instead of an additional cable). The cable and the connector can be deployed as usual.
- The MP85A(DP)-S is ready for use within seconds



# Process analysis with tolerance windows / measurement and visualization

The following windows are used to evaluate the production process:

- 1 alarm window Limits at which an alarm is triggered. This window is used to protect the machine.
- 1 range window Defines the range in which measured values are stored, within which all the other tolerance windows are positioned.
- 1...9 tolerance windows For analyzing the switching and closing actions. In switch check mode, the switching contacts are evaluated via the digital inputs. Haptic windows monitor the switching characteristics. With standard tolerance windows, there is a free choice of incoming and outgoing sides; the windows can be evaluated in real time. All window types can be freely used and can also be overlapped.
- x/y limit values Optional for monitoring minimum/maximum values at process start/end.

The screenshot displays a software window titled 'ID11 Curve' showing a graph of Channel y [N m] versus Channel x [deg]. The graph features several tolerance windows: 'Alarm window' (green background), 'Range window' (white background), and 'Haptic\_s1on' (white background). The graph also shows 'switch 1 on', 'switch 1 off', 'switch 2 on', 'switch 2 off', and 'switch 3 on' events. The data table below the graph provides detailed results for these windows.

Unit Results:	X1	Y1	X2	Y2	X3	Y3	X4	Y4	
Result									
Range window	114.9	-0.106	136.5	0.173	10.7	0.088	136.7	0.173	
switch 1 on [Switch]	OK						30.2	-0.037	
switch 1 off [Switch]	OK						57.2	0.108	
switch 2 on [Switch]	OK						72.5	-0.027	
switch 2 off [Switch]	OK						101.2	0.095	
switch 3 on [Switch]	OK						116.2	-0.03	
switch 3 off [Switch]	OK						116.2	0.096	
Haptic_s1on [Haptic]	OK	30.2	-0.037	24.2	0.102	22	0.097	38.5	-0.02
Haptic Window	Haptic Result	Activation Force Fa	Reverse Force Ff	Difference Force Fa/Ff	Difference Displacement S/Sa	Force Displacement Ratio	Click Ratio [%]		
Haptic_s1on [Switch]	Haptic OK	0.102	-0.037	0.139	6	0.023	136		

**Thread-in window:**  
Start window operates in real time (to protect the machines and the system)

**Process window:**  
Monitors the force/displacement (or torque/angle of rotation) curve of the switch or closing system

**Switch check window:**  
Monitors the function and position of the electrical contact of a switch. As many as 5 switching contacts can be checked in one procedure.

**Haptic window:**  
Monitors the switching characteristics of the switch or closing system.

**Thresholds:**  
Thresholds monitor the process curve in defined ranges.

**Block window:**  
The end window monitors the end force.

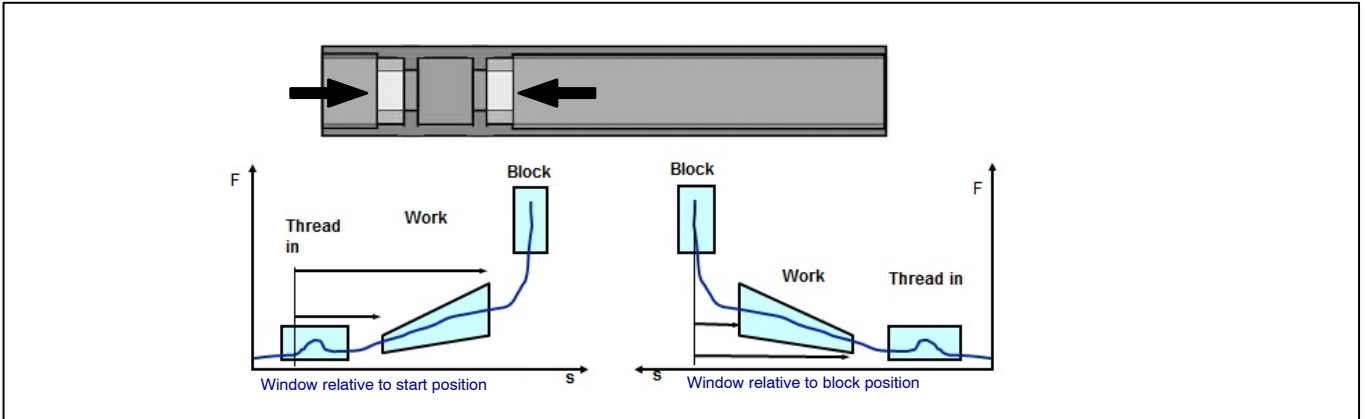
## Coordinate systems:

Tolerance window coordinates can be defined absolutely or relatively (dynamically). Use the relative system of coordinates if the absolute position of the workpieces/test specimens is not always the same. It is possible to mix these two window types.

## Application:

### Analysis with tolerance windows

With relative x coordinates, all that is measured is the movement from the start or end position, *relative* to the x axis of the two test pieces.



## Start/Stop conditions

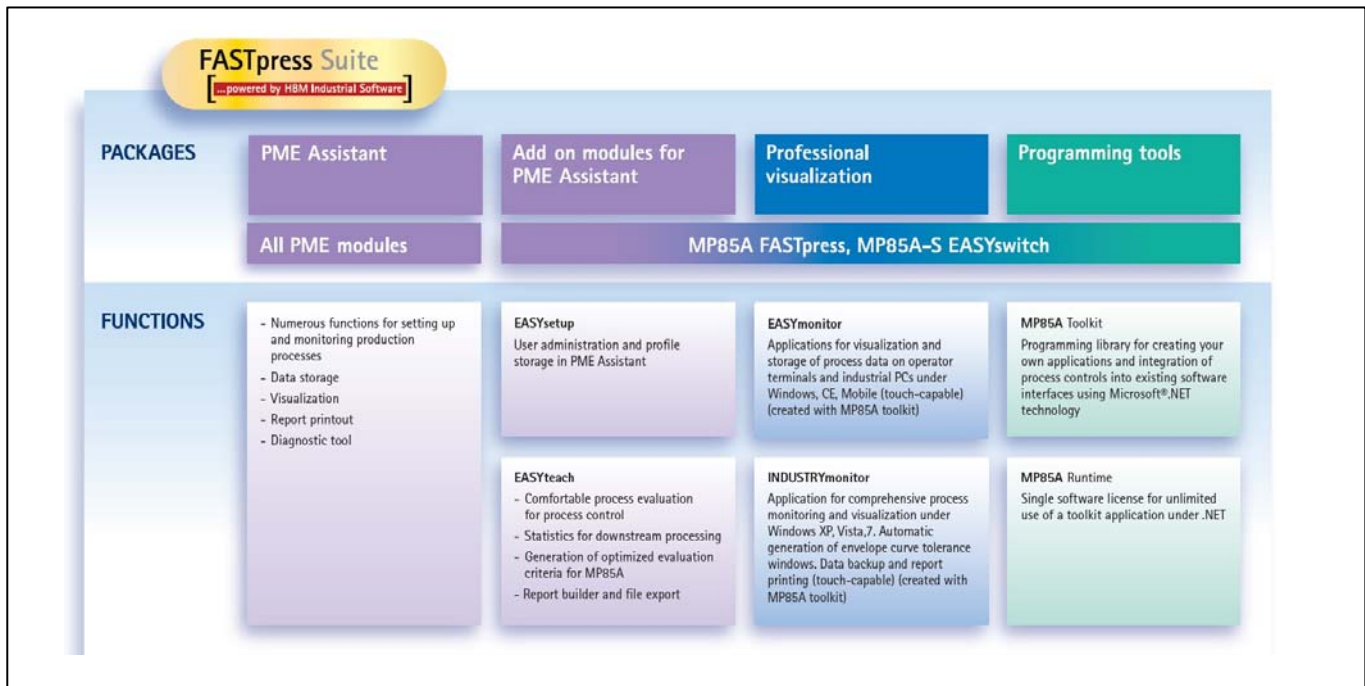
The start/stop conditions are used to synchronize measurement control to the checking process. Signaling is optional via CANopen, PROFIBUS-DPV1, digital input or internal trigger.

Start/stop conditions are available for a wide variety of applications, such as:

- External start/stop signal
- Setpoint y and overshoot time
- Setpoint x and overshoot time
- Setpoint x and setpoint y
- Standstill recognition
- Return detection for channel x

## Operation and visualization

Standard operator panels (IPCs) can be used to visualize the process in situ. The device can also be integrated at a later date into existing systems. Connection is made via the (Fast) Ethernet interface of the MP85A(DP)-S devices. Numerous modules of the FASTpress Suite are provided as software solutions.



## Quality control / Statistics / Counting

The screenshot displays two windows from the FASTpress Suite software. The top window, titled 'ID:230 3D graph', shows a 3D bar chart with 'Processes' on the vertical axis (0 to 200) and 'Tolerance window number' and 'Parameter set' on the horizontal axes. A table in the top right corner provides process counts:

Category	Total
OK processes	170
NOK processes	321
All processes	491

The bottom window, titled 'ID:230 Distribution (bin counting)', shows two 2D histograms. The left histogram is for 'Y Min' and the right for 'Y Max'. Both histograms show the distribution of processes across different tolerance window classes (1 to 5). A statistics table in the top right of this window provides the following data:

Parameter set	Tolerance window	Mean	Y Min	Y Max	Standard dev.:
1	1	11,49325	13,21432	9,314998	

Quality and tool wear for the checking process are assessed using statistics functions.

Statistics graphics can be called to clearly display OK/ NOK processes.

Global statistics with a process counter are grouped by parameter sets.

The tolerance window result can be read at a glance for each parameter set.

This allows

- Tool wear
- Component tolerances or
- Damage to a machine

to be detected early.

The graphic display in Counting can be used to analyze the distribution of the OK/NOK processes individually for each tolerance window.

Counting automatically calculates the distribution of the minima and maxima with accompanying standard deviation.

The statistics data are stored in the device.

## Data management / Loading and storing



With the MP85A(DP)-S, it is possible to store results, curves, statistics and the device settings. This allows processes to be analyzed later on and ensures 100% traceability.

You can choose whether to store the data on your PC or on the memory card in the device. Storage on a memory card can be set up as a circular buffer for the last 1,000 or 10,000 curves. In both cases, curves and/or results can be stored in ASCII or Qdas format:

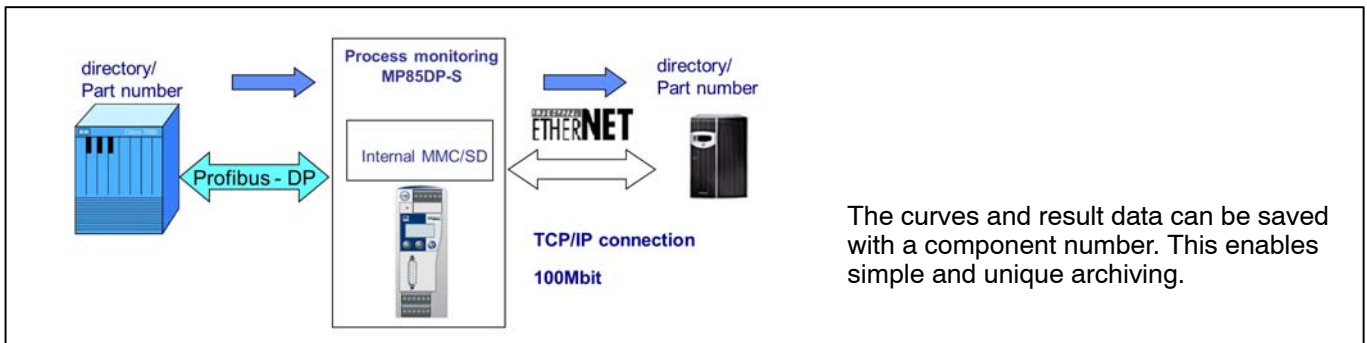
- NOK processes only or
- OK processes only or
- All processes

The data on the memory card can then be transcribed to the PC. A report with all process information can be printed for each process if necessary.

A free HBM software tool can be used to automatically convert process data and results after storage in the data format I-P.M.

## Management of production data

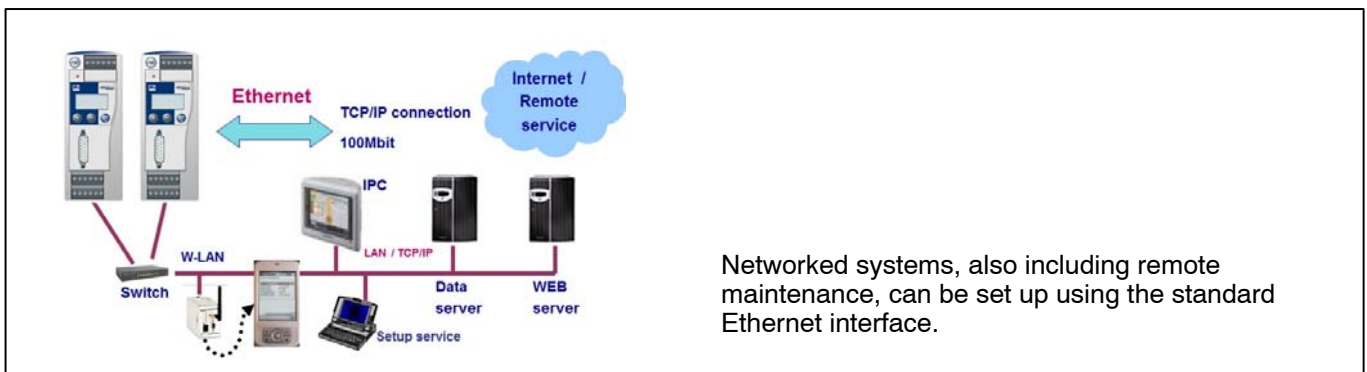
The MP85A(DP)-S offers the possibility of saving workpiece or component numbers in the ongoing production in the curve and result files. This ensures assignment and archiving.



The curves and result data can be saved with a component number. This enables simple and unique archiving.

## Utilizing an existing infrastructure

The devices can be integrated in a network via the standard Ethernet interface. This makes it possible to set up functional production structures right up to remote maintenance.



Networked systems, also including remote maintenance, can be set up using the standard Ethernet interface.

# Specifications

Basic device		MP85A-S / MP85ADP-S
Accuracy class		0.1
Supply voltage, Overvoltage and reverse polarity protection	$V_{DC}$	24
Isolation voltage, without transients Functional potential separation between the supply and transducer connection. Must not be used for safety considerations.	$V_{DC}$	< 60
Permissible supply voltage range	V	18...30
Power consumption MP85A-S, typically MP85ADP-S, typically MP85A-S / MP85ADP-S, max.	W W W	7 9 10
Behavior in the event of a supply voltage failure		Automatic data retention after power failure
Typical backup battery life (CR2032) for the realtime clock	Years	5
Evaluation unit specifications		
Max. number of triple measurement values (channel x), (channel y), (time)		4000 (automatic data reduction)
Sampling rate	Hz	2400
Start conditions		Internal start signal, External start signal Setpoint x, Setpoint y, Setpoint x + Setpoint y
Stop conditions		Internal stop signal, External stop signal Setpoint y + Overshoot time, Setpoint x + Overshoot time Setpoint x + Setpoint y + Overshoot time Standstill recognition, Return channel x
Process end conditions		External signal Simultaneously with end of start condition Setpoint x, Setpoint y, Setpoint x and setpoint y
Number of parameter sets / Measurement programs in the device		31 plus factory setting
Number of parameter sets on the optional SD/MMC		31 in XML format 1000 in binary format
Typical switching between parameter sets	ms	200
Evaluation		
Tolerance windows, maximum number		9
Type of window		Oblique or straight
Evaluation methods per window		Switch check Haptic check Real time evaluation (online for machine protection) Analyzing the course of the curve in the window (min/max) Analyzing the mean x or y value in the window Analyzing vertical or horizontal thresholds (online)
x coordinates for the tolerance window		Absolute or relative to the start position, or relative to the end position
y coordinates for the tolerance window		Absolute or relative to $F_{min}$ of tolerance window 2, relative to $F_{max}$ of tolerance window 2 or relative to $F_{mean}$ of tolerance window 2
Typical duration of offline evaluation, end window	ms	6
Typical duration of offline evaluation, straight window	ms	5 + 0.1/measurement pair in window
Typical duration of offline evaluation, oblique window	ms	10 + 0.3/measurement pair in window
x and y limit values		4 each Limit value monitoring can optionally also be included in the overall process evaluation, e.g. as min/max monitoring for process start/end.
Statistics (separate for each parameter set in Flash device memory)		
Maximum number of test procedures		$4 \times 10^9$
Number of histogram classes for 2 values ( $X_{max}$ , $X_{min}$ , $Y_{max}$ , $Y_{min}$ )		9 per tolerance window



Transducer and amplifier							
<b>Carrier frequency</b>	kHz	4.8 ± 1 %					
<b>Bridge excitation voltage</b>	V <sub>rms</sub>	2.5 ± 5 %					
<b>Transducers that can be connected</b> Strain gages, half and full bridges Inductive half and full bridges, LVDTs Potentiometric transducers	Ω mH Ω	170 ... 2000 4 ... 160 170 ... 2000					
<b>Input sensitivities</b>		Measuring range (mV/V)					
	mV/V	4	100	1000			
<b>Length of transducer cable, max.</b>	m	0.2 ... 4					
<b>Scaling range, max.</b>	Digits	3.5 ... 100					
<b>Scaling range, min.</b>	Digits	50 ... 1000					
<b>Permissible common-mode voltage, max.</b>	V	± 5.5					
<b>Common-mode rejection</b> 0...60 Hz 0...1000 Hz 0...4800 Hz	dB	> 120					
	dB	> 96					
	dB	> 50					
<b>Linearity error</b>	%	< 0.03					
<b>Noise voltage, typically</b>  0...1 Hz 0...10 Hz 0...100 Hz 0...1000 Hz		Measuring range (mV/V)					
		4	100	1000			
	μV/V <sub>pp</sub>	0.1	2.5	25			
	μV/V <sub>pp</sub>	0.25	6	60			
	μV/V <sub>pp</sub>	1	25	250			
<b>Sampling rate, max.</b>	1/s	50					
<b>Measurement frequency range, adjustable</b> 4th order low-pass with Bessel characteristic		<b>Nominal (rated) value f<sub>c</sub> (Hz)</b>	<b>-1dB (Hz)</b>	<b>-3dB (Hz)</b>	<b>Phase delay (ms)</b>	<b>Rise time (ms)</b>	<b>Overshoot (%)</b>
		1000	980	1400	0.550	0.260	4
		500	440	690	0.860	0.510	1.5
		200	190	320	1.6	1.11	1.5
		100	100	160	2.9	2.13	1.3
		50	51	83	4.6	4.24	1
		20	25	41	8.2	8.36	1
		10	13	21	15.5	16.8	0
		5	6.1	10.3	30.2	33.4	0
		2	3.1	5.2	60	67	0
		1	1.6	2.6	119	137	0
		0.5	0.79	1.30	240	272	0
		0.2	0.19	0.32	950	1070	0
		0.1	0.09	0.16	2500	2170	0
	0.05	0.049	0.081	3750	4280	0	
<b>Shunt calibration</b>	mV/V	2400					
<b>Effect of operating voltage</b> on zero point on sensitivity	% f.s. % f.s.	1 ± 3%					
<b>Effect of 10K change in ambient temperature</b>  on full bridge zero point on half bridge zero point on sensitivity	μV/V μV/V %	Measuring range (mV/V)					
		4	100	1000			
		1	20	200			
		10	40	200			
		0.05	0.05	0.05			
<b>Long-term drift over 48 h</b> (measuring range 4 mV/V; 0.5 h after activation)	μV/V	2					

DC-voltage transducers		
Transducers that can be connected		DC-voltage transducers, voltage sources
Nominal (rated) measuring range	V	± 10
Input signal range	V	± 10.5
Scaling range, max.	Digits	999999, at 10% of the input measuring range
Scaling range, min.	Digits	100, at 10% of the input measuring range
Internal resistance of the signal source	kΩ	≤ 1
Permissible common-mode voltage, max.	V	2
Measurement frequency range, adjustable (-1 dB)	Hz	0.05 ... 1000
Filter characteristics		Bessel, 4th order
Linearity error	%	< 0.03
Sampling rate, max.	1/s	2400
Incremental encoder		
Transducers that can be connected		Incremental transducers (up/down counter with zero index signal)
Voltage supply		5 V, max. 150 mA or 24 V, max. 300 mA
2-channel mode		Time-division multiplex method
Inputs (F1 (±), F2 (±), Ix (±))		Differential inputs (RS422), TTL level 5 V
Input level		
Low level	V	< 0.8
High level	V	> 2
Each line to measurement ground, max.	V	± 14
Level difference (Low/High)	V	> 1.2
Hysteresis	V	0,07
Permissible common-mode voltage, max.	V	-7 / +12
Input impedance, typical	kΩ	10
Detection of direction of rotation		via ± 90° phase-shifted signal F2
Input range pulse counting	Pulses	0 ... 999999
Maximum pulse rate	Pulses /s	1 000 000
Interval between 2 successive edges F1(±), F2(±)	ns	> 400
Scaling range, max.	Digits	20 at 1 pulse
Scaling range, min.	Digits	1 at 10000 pulses
Measurement frequency range, adjustable (-1 dB)	Hz	0.05 ... 1000
Sampling rate, max.	1/s	2400
SSI transducers		
Transducers that can be connected		Displacement and angle transducers with SSI interface
Voltage supply		5 V, max. 150 mA or 24 V, max. 300 mA
2-channel mode		Time-division multiplex method
Data input D(±)		Differential input (RS422), TTL level 5 V. The voltage levels must be complementary to each other and display a difference of min. 1.2 V.
Input levels, data input D (±)		
Low level	V	< 0.8
High level	V	> 2
Each line to measurement ground, max.	V	± 14
Hysteresis	V	0,07
Permissible common-mode voltage, max.	V	-7 ... +12
Clock output CI (±)		Differential output (RS422), TTL level 5 V
Differential output voltage CI(±), without load, max.	V	5.8
Differential output voltage CI(±), RL = 50 ohm, min.	V	2
Common-mode voltage at CI (±), max.	V	3
Short-circuit current, clock output CI (±), typically	mA	100
Resolution, single turn	Bit	12, 13
Resolution, multi-turn	Bit	24, 25
Scaling range, max.	Digits	20 at 1 pulse
Scaling range, min.	Digits	1 at 10000 pulses
Measurement frequency range, adjustable (-1dB)	Hz	0.05 ... 1000

<b>Sampling rate, max.</b>	1/s	1200
<b>Baud rates</b>	kBaud	100, 200, 500, 1000
<b>Coding</b>		Gray code
<b>Potentiometric displacement transducer</b>		Potentiometric sensors (termination resistance 170 ... 2000 Ohm) are supplied with 4.8 kHz carrier frequency (see specifications "Transducer and amplifier")

**Note:** If potentiometric sensors of type TR50, TR75 or TR100 are used from the company novotechnik (termination resistance > 2 kOhm), the accuracy class of the measurement chain changes to 0.25. The same applies to other sensors where the termination resistance is more than 2 kOhm, as a linear characteristic curve is no longer given in these cases.

<b>General specifications</b>		
<b>Limit value switch</b>		
Number		4 per channel
Reference level		Gross
Hysteresis	%	1 ... 100
Adjustment accuracy	Digit	1
Response time, typically (fc=1000 Hz)	ms	<2
<b>Control outputs</b>		
Number		4 (MP85ADP(-S)) / 8 (MP85A(-S)), galvanic separation
Function		Process OK/NOK, process started/running, process finished/valid, limit values 1-4, transducer test result, tolerance window result, memory card status, channel x/y status, transfer memory status, channel x/y error, heartbeat (watchdog), parameter set selection, parameter set No. (Flash), piezosensor reset, digital output via SDO specification
Nominal (rated) voltage, external power supply	V <sub>DC</sub>	24
Permissible supply voltage range	V	10 ... 30
Maximum output current per output	A	0.5
Short-circuit current, typically (U <sub>ext.</sub> = 24 V, R <sub>L</sub> < 0.1 ohm)	A	0.8
Short-circuit period		unlimited

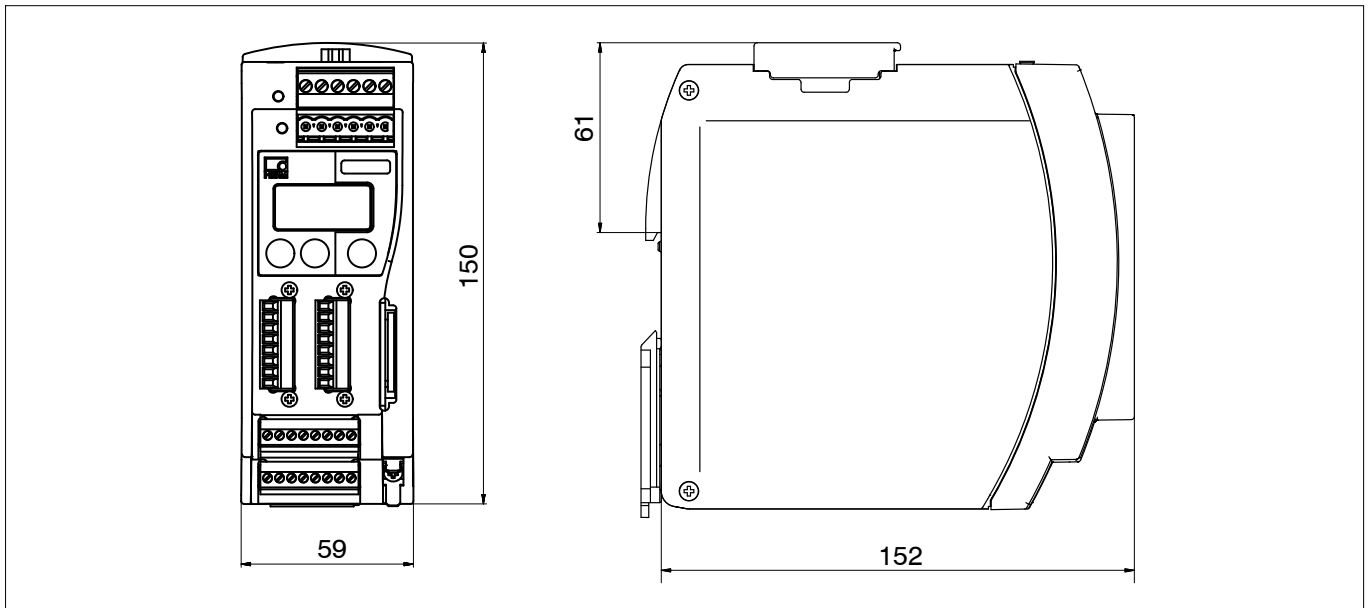
<b>Control inputs</b>		
Number		1 (MP85ADP-S) / 5 (MP85A-S), electrically isolated
Function		Switch check (up to 5 for MP85A-S), zero balance, shunt calibration, parameter set selection, start/stop process, transducer test, save/delete statistics
Input voltage range LOW	V	0 ... 5
Input voltage range HIGH	V	10 ... 30
Input current, typically, (High level = 24 V)	mA	12

<b>Ethernet interface</b>		
Transmission protocol	MBit/s	TCP/IP, can be networked per IEEE802
Transfer rate, max.	MBit/s	10 and 100 (automatic selection)
Topology (twisted pairs)		2
LED display for Receiver, Transmitter (RxD/TxD) and Link		2
Line length, maximum	m	100
Cable type		UTP category 5 or shielded twisted pair (STP)
Connecting socket		RJ-45

<b>CAN interface</b>		
Protocol		CAN 2.0B; CANopen compatible
Hardware bus link		to ISO 11898
PDO rate, max.	Measured values/s	100
Baud rates	kBits/s	1000 500 250 125 100 50 20 10
Maximum line lengths	m	25 250 500 1000 600 1000 1000 1000
Termination resistor		Connectable by switch
Connection		Terminals

<b>PROFIBUS-DP interface (MP85ADP-S only)</b>		
<b>Protocol</b>		PROFIBUS-DP Slave, as per DIN19245-3
<b>Baud rate, max.</b>	MBaud	12
<b>Node address</b>		3-123, set via the keyboard
<b>PROFIBUS ID number</b>		Hex 699
<b>Configuration data</b>	Byte	5
<b>Parameter data , max.</b>	Byte	6 (+7DP standard)
<b>Function</b>		Access to and parameterization of all MP85ADP-S functions (remote control)
<b>Parameterization (asynchronous)</b>		per DPV1 standard
<b>Input data , max.</b>	Byte	142
<b>Output data, max.</b>	Byte	40
<b>Input data update rate</b>	ms	1 (for 4 measured values)
<b>Output data update rate</b>	ms	< 10, for zero setting, limit values
<b>Diagnostic data</b>	Byte	48
<b>PROFIBUS connection</b>		9-pin sub-D (DIN19245-3), galvanic separation from power supply and measurement ground
<b>Memory card</b>		
Function		Storage of: Parameter sets, curves and results, statistics, circular buffer of last 1,000/10,000 curves
Usable types		MMC or SD card (no SDHC (High Capacity) or similar)
Usable sizes	MByte	8, 16, 32, 64, 128, 256, 512, 1024, 2048
Data transmission rate, typically	kBytes /s	2-8
File system		DOS, FAT16 format
<b>Display</b>		
Type		2-line, 8-character alphanumeric, LCD
<b>Keypad</b>		Touch-sensitive keypad with three keys, pressure-sensitive
<b>temperature range</b>		
Nominal (rated) temperature range	°C	0 ... 50
Operating temperature range	°C	-20 ... +50
Storage temperature range	°C	-20 ... +70
<b>Degree of protection</b>		IP20
<b>Dimensions (W x H x D)</b>	mm	59 x 150 x 152
<b>Weight, approx.</b>	g	929
<b>Mechanical stress capability</b> (test similar to DIN IEC 60068, Part 2-6)		
<b>Oscillation</b> (30 mins in each direction)	m/s <sup>2</sup>	50 (5 ... 65 Hz)
<b>Impact</b> (3 times in each direction; impact duration 11 ms) (test similar to DIN IEC 60068, Part 2-27)	m/s <sup>2</sup>	200

## Dimensions of the PME modules:



## Scope of supply

- 4 plug-in screw terminals, coded
  - 1x voltage supply and CAN, 6-pin
  - 2 x transducers, 8-pin
  - 1x In/Out digital, 8-pin

Phoenix order number:	HBM order number:
MV STBW 2.5/6-ST-5.08 GY	3-3312.0426
MCVW 1.5/8-ST-3.81 GY	3-3312.0422
MC 1.5/8-ST-3.5 GY	3-3312.0421

### FASTpress Suite system CD with:

- Free PME Assistant setup software
- Online Help with Tricks&Tips
- Quick Reference Guide for beginners

### PME Assistant Plus tools (demo version) with:

- EASYsetup (user administration)
- EASYteach (statistical process analysis and report generation)

### MP85A Toolkit (demo version):

- Function module kit for creating separate interfaces on operator panels via Ethernet under Windows XP, Windows CE and Windows Mobile

### EASYMonitor CE (demo version):

- Production software for operation via a terminal using the operating system Windows CE

### EASYmonitor mobile: Application for operation via a PDA or pocket PC

### INDUSTRYmonitor (demo version):

- Production software for operation on Touch Panels with max. 12 MP85A(DP)-(S)-process controllers

### Accessories (not included in the scope of supply):

- Memory card MMC or SD card, e. g. from Transcend ([www.transcend.de](http://www.transcend.de))
- Standard flat ribbon cable, 10-pin, 1.27 mm pitch (HBM order number : 4-3131.0037)

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measure and predict with confidence

