

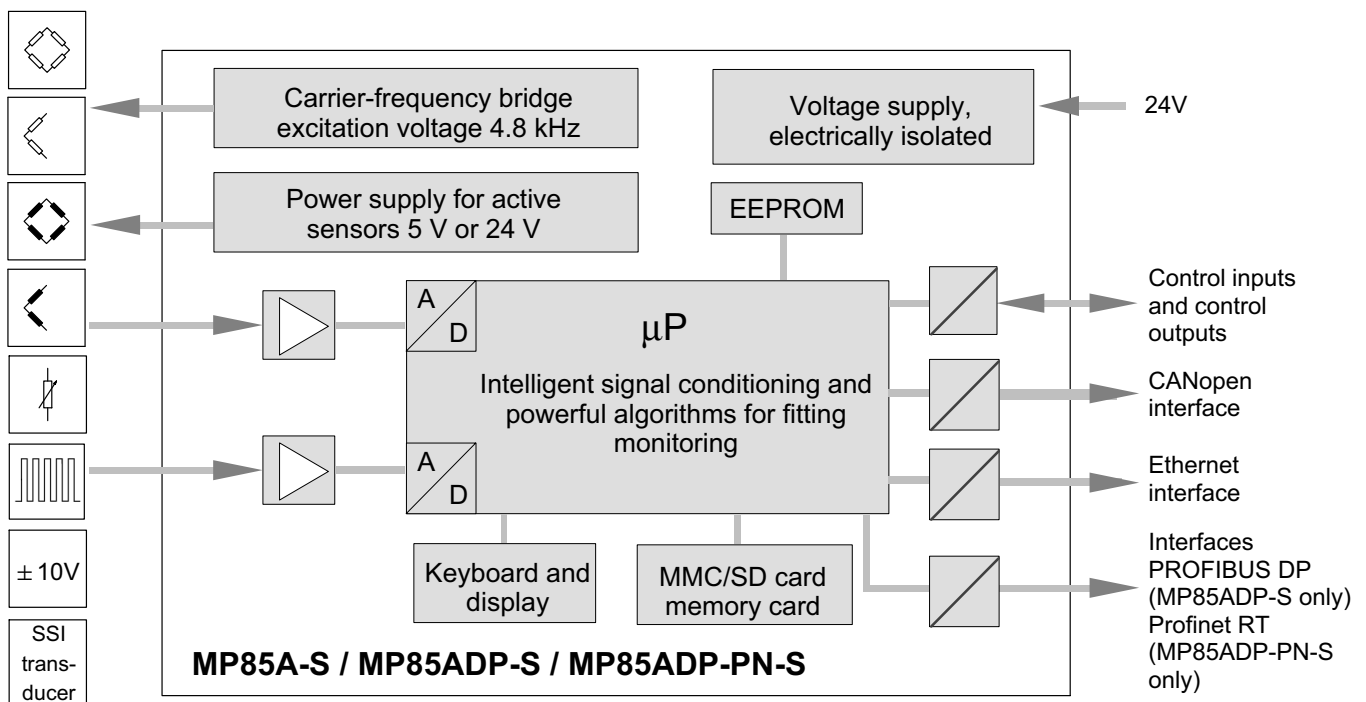


MP85A-S MP85ADP-S MP85ADP-PN-S

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 in automation systems via standard Ethernet or CANopen, PROFIBUS DPV1 and Profinet RT fieldbus interfaces



Description

Switch checking device for production and laboratory

With the MP85A-S/ADP-S/ADP-PN-S 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, and also the switching characteristics of single pole or multipole voltage switches, can be objectified and documented.

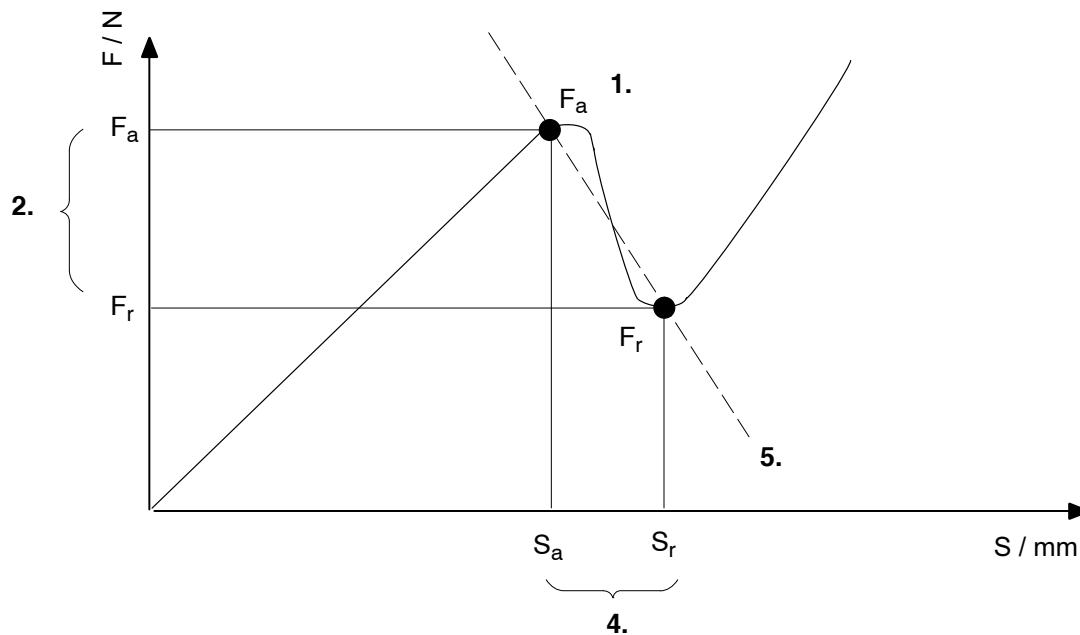
With the EASYswitch, you can integrate quality assurance in your checking process.

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

Performance features and advantages:

- Easy configuration and commissioning with the free PME Assistant parameterization and visualization software. Download at www.hbm.com -> Service & Support -> Downloads > Firmware & Software > MP85A.
- 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 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



Evaluation criteria:

1. Force at mechanical switching peak F_a
2. Drop in force after mechanical switching peak $F_a - F_r$
3. Click ratio $(F_a - F_r) / F_a \times 100\%$
4. Displacement differential $S_r - S_a$
5. Force/displacement ratio $(F_a - F_r) / (S_r - S_a)$

B) Switch check of electric switching systems

Solutions for test functions

You can check up to 5 switching events simultaneously or consecutively via the integrated digital inputs or the fieldbus interface (digital transmission of switching events):

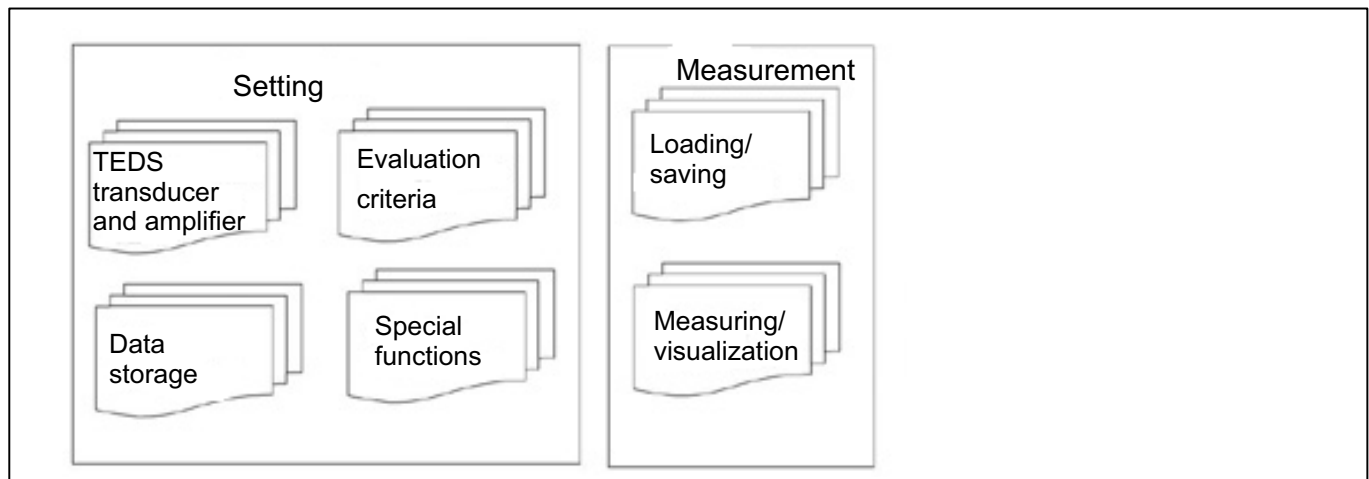
- Whether the switching point or switching process is within the switch check window
- Whether the switching direction (NC/NO contact) is correct
- Whether the correct actuating force/torque is present
- Whether switching repetitions have occurred

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

OK/NOK testing controls production and helps to minimize downtime. Warning limits monitor the production process, enabling machine protection, while control signals control Start/Stop. Limit value shutdown takes place either via digital inputs, Ethernet, PROFIBUS DPV1 or the Profinet RT interface (optional).

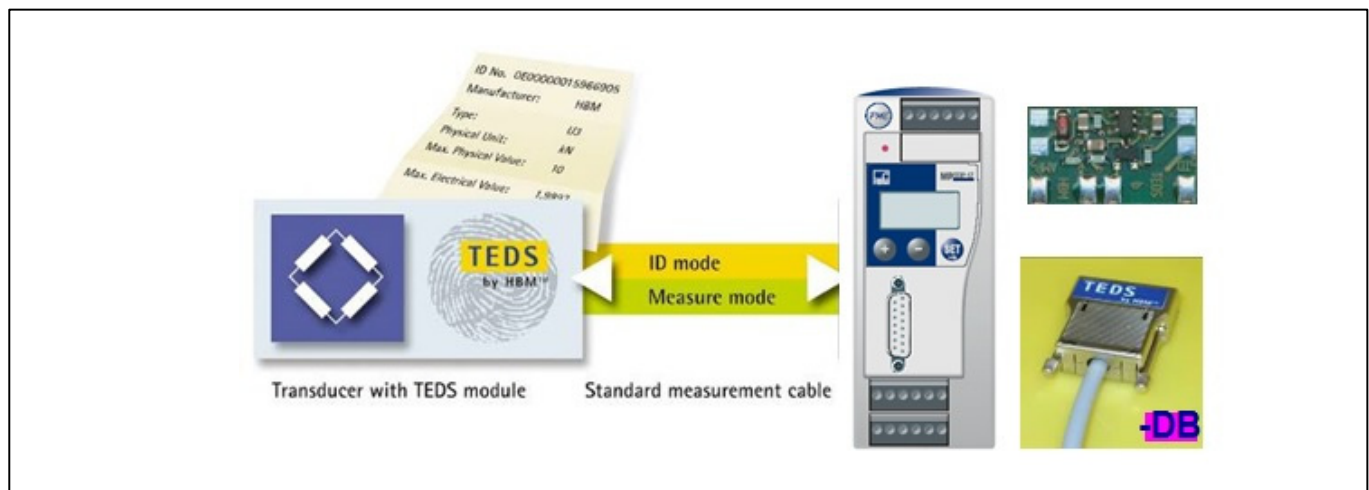
All the individual and cumulative results, switching curves and switching events (break/make function) are stored.

Function blocks of the MP85A-S/MP85ADP-S/MP85ADP-PN-S EASYswitch



Immediate utilization of evaluation criteria

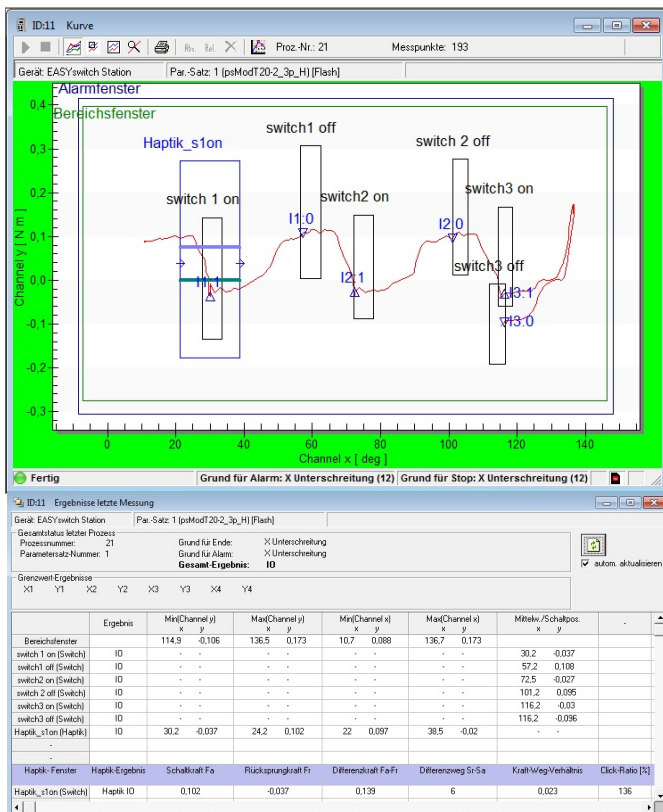
- Sensor data does not need to be set manually when using sensors with TEDS technology
- The TEDS data is read via the sense leads from the sensor (instead of an additional cable). The cable and the connector can be deployed as usual.
- The MP85A-S/MP85ADP-S/MP85ADP-PN-S is ready for use within seconds



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 and within which all the other tolerance windows are situated. |
| 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 the tolerance windows, you can select the incoming and outgoing sides as desired, and the windows can be evaluated in real time. All window types can be freely used and can also overlap. |
| x/y limit values | Optional for monitoring minimum/maximum values at process start/end. |



Thread-in window:

The start window works in real time (to protect the machines and 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:

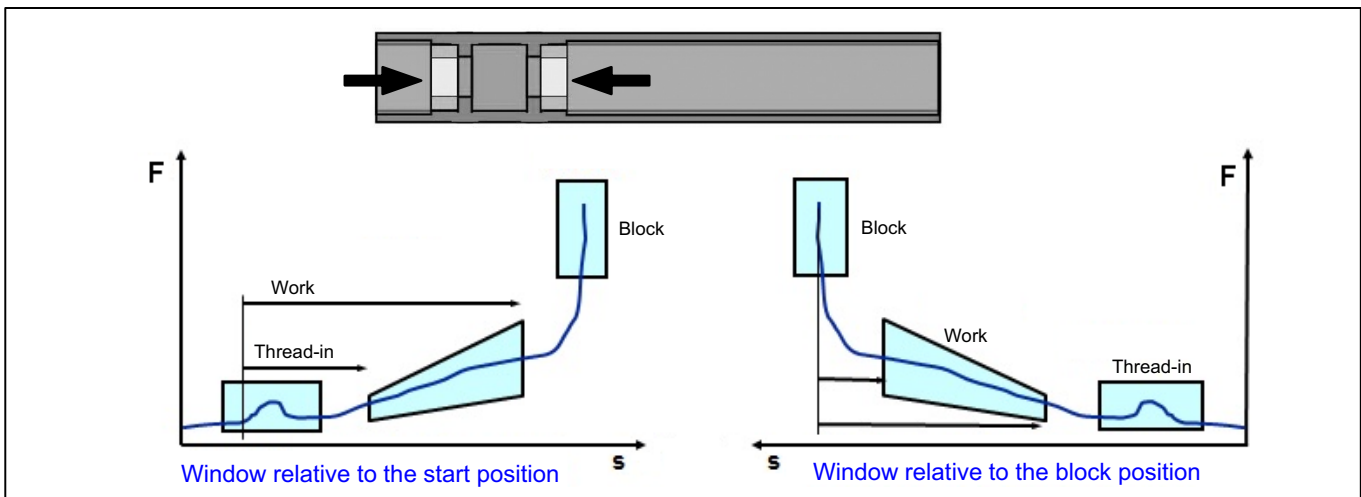
The end window monitors the end force.

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. You can also mix these two window types.

Evaluation 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

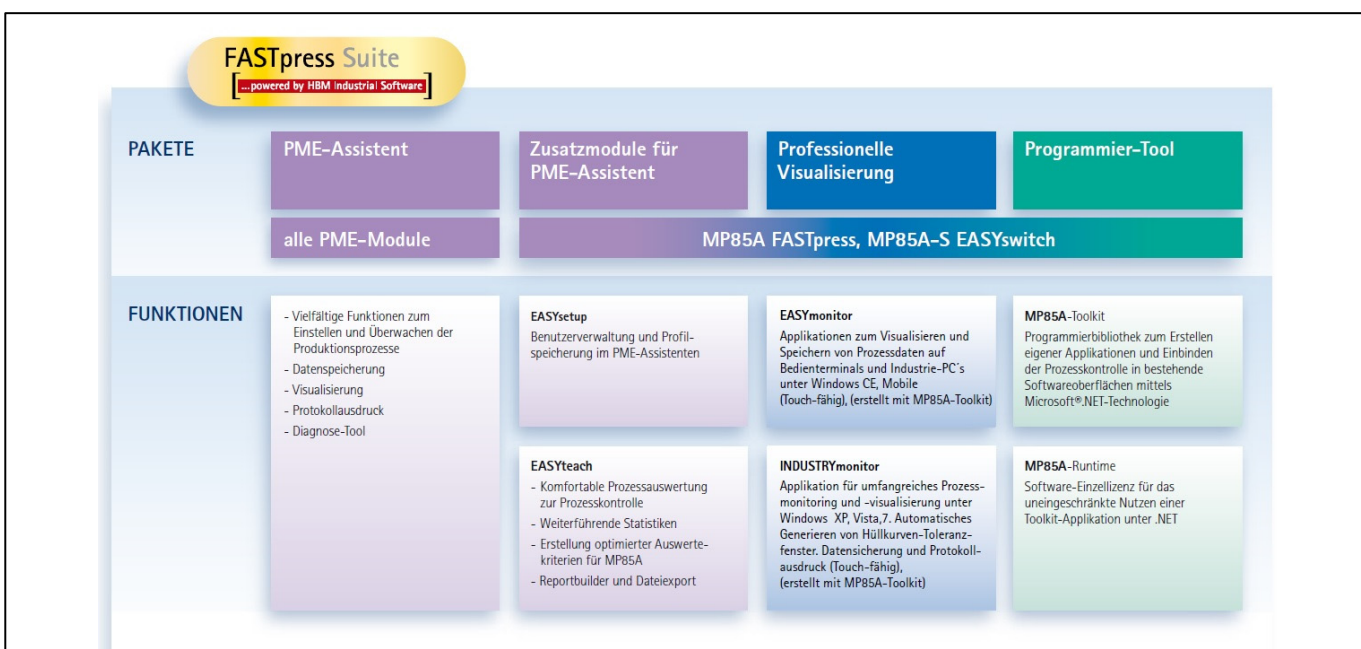
The start and stop conditions are used to synchronize measurement control with the checking process. Signaling is optional via CANopen, PROFIBUS DPV1, Profinet RT, digital input or internal trigger.

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

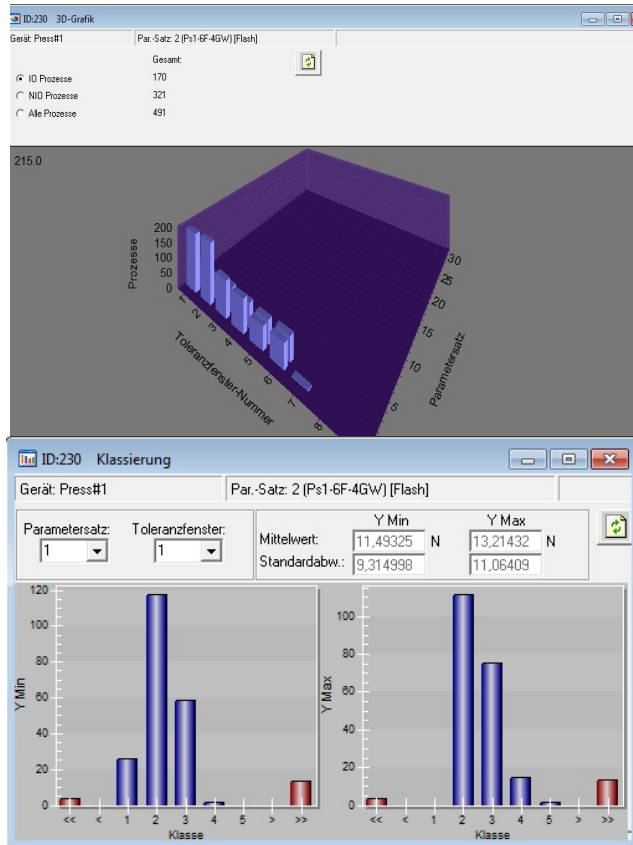
- External start and stop signal
- Target value y and overshoot time
- Target value x and overshoot time
- Setpoint x and setpoint y
- Standstill recognition
- Return detection for channel x

Operation and visualization

Standard operator panels (IPCs) can be used to visualize the process in situ. The device can also be retrofitted in existing systems. Connection is via the (Fast)Ethernet interface of the MP85A(DP) devices. Numerous modules from the FASTpress Suite are available as software solutions.



Quality control / Statistics / Counting



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

You can view a clear display of OK/NOK processes by opening the statistics graphics.

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

You can therefore gain a good overview of the results of the tolerance windows for each parameter set.

This enables early detection of

tool wear,

component tolerances, and

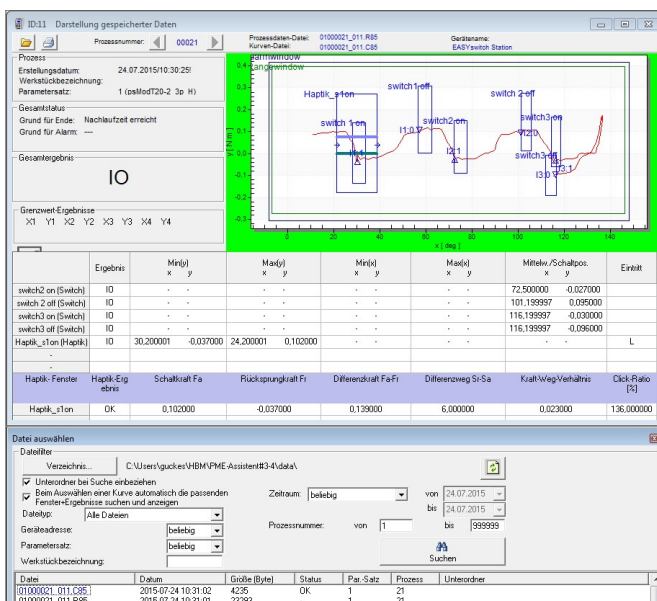
damage to a machine.

You can use the graphic display in Counting 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, saving



The MP85A-S/ADP-S/ADP-PN-S offers you the option of saving results, curves, statistics and 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 1000 or 10,000 curves. In both cases, curves and/or results can be stored in ASCII or Qdas format:

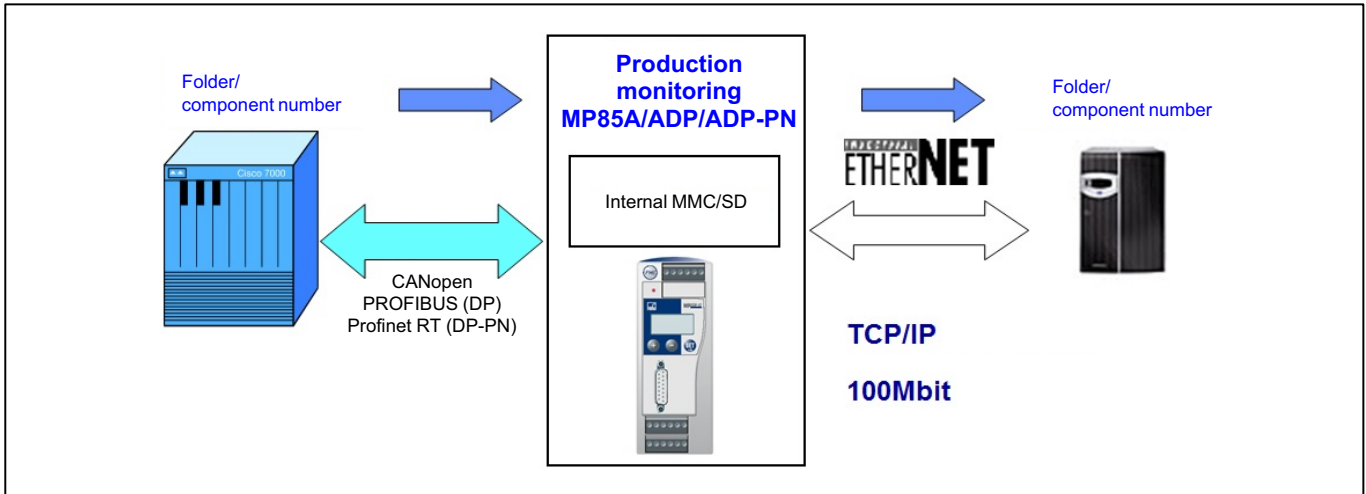
- NOK processes only, or
- OK processes only, or
- all processes

You can then copy the data on the memory card onto the PC. For each process, you can print out a report with all process information if necessary.

Using a free HBM software tool, you can automatically convert process curves and results into the I-P.M. data format after storage.

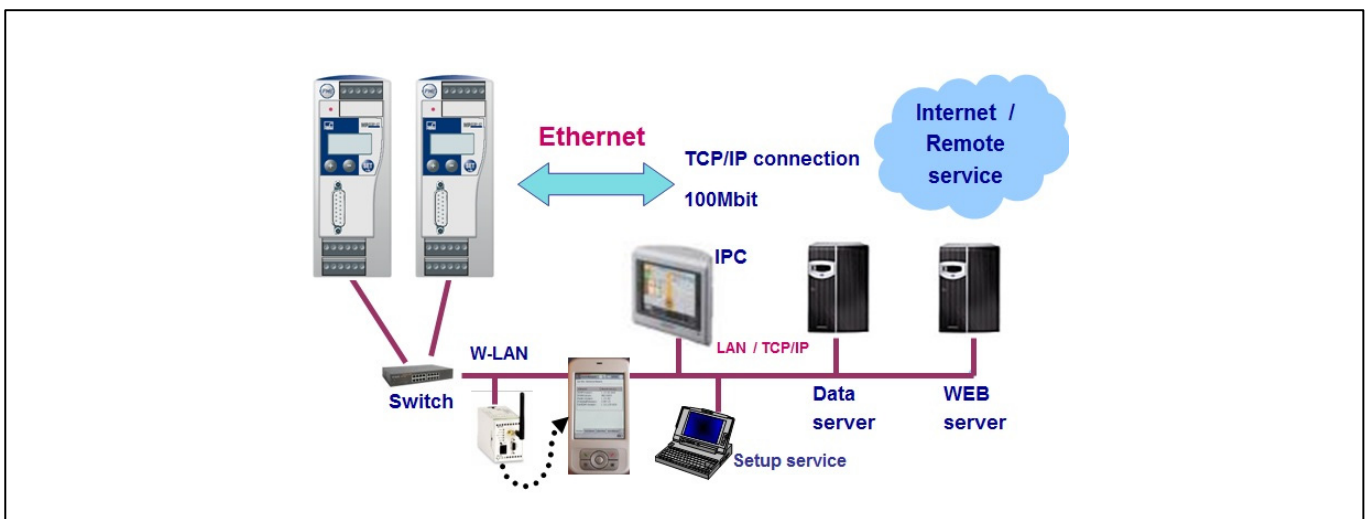
Management of production data

The MP85A-S/ADP-S/ADP-PN-S offers you the option of saving workpiece or component numbers during ongoing production together with the curve and result files. They can therefore be tracked and archived.



Utilizing the existing infrastructure

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



Specifications

Basic device		MP85A-S / MP85ADP-S / MP85ADP-PN-S
Accuracy class		0.1
Supply voltage, overvoltage and reverse polarity protection	V _{DC}	24
Isolation voltage, without transients Functional electrical isolation between the power supply and transducer connections. Must not be used for safety appraisals	V _{DC}	< 60
Permissible supply voltage range	V	18...30
Power consumption		
MP85A-S, typical	W	7
MP85ADP-S, typical	W	9
MP85A-S / MP85ADP-S, max.	W	10
Behavior in the event of a supply voltage failure		Automatic data retention after power failure
Typical backup battery life (CR2032) for the real-time 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

Analysis				
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 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 x 10 ⁹		
Number of histogram classes for 2 values (x _{max} , x _{min} , y _{max} , y _{min})		9 per tolerance window		
Transducer and amplifier				
Carrier frequency	kHz	4.8 ± 1 %		
Bridge excitation voltage	V _{rms}	2.5 ± 5 %		
Transducers that can be connected				
Strain gage, half and full bridges	Ω	170 ... 2000		
Inductive half and full bridges, LVDTs	mH	4 ... 160		
Potentiometric sensors	Ω	170 ... 2000		
Input sensitivities		Measuring range (mV/V)		
		4	100	1000
	mV/V	0.2 ... 4	3.5 ... 100	50 ... 1000
Length of transducer cable, max.	m	500		
Scaling range, max.	Digits	999999, at 10 % of the input measuring range		
Scaling range, min.	Digits	100, at 100 % of the input measuring range		
Permissible common-mode voltage, max.	V	± 5.5		
Common-mode rejection				
0...60 Hz	dB	> 120		
0...1000 Hz	dB	> 96		
0...4800 Hz	dB	> 50		
Non-linearity	%	< 0.03		
Typical noise voltage		Measuring range (mV/V)		
		4	100	1000
0...1 Hz	μV/V _{pp}	0.1	2.5	25
0...10 Hz	μV/V _{pp}	0.25	6	60
0...100 Hz	μV/V _{pp}	1	25	250
0...1000 Hz	μV/V _{pp}	2	50	500
Data rate, max.	1/s	2400		

Measurement frequency range, adjustable 4th order low-pass with Bessel characteristic		Nom. (rated) value f_g (Hz)	-1dB (Hz)	-3 dB (Hz)	Phase shift (ms)	Rise time (ms)	Overshoot (%)
		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
Shunt calibration	mV/V	1 ± 3%					
Effect of operating voltage							
on zero point	% f.s.	< 0.01					
on sensitivity	% f.s.	< 0.01					
Effect of 10K change in ambient temperature		Measuring range (mV/V)					
		4	100		1000		
on full bridge zero point	μV/V	1	20		200		
on half bridge zero point	μV/V	10	40		200		
on sensitivity	%	0.05	0.05		0.05		
Long-term drift over 48 h (measuring range 4 mV/V; 0.5 h after activation)	μV/V	2					
DC voltage sensor							
Transducers that can be connected		DC voltage sensor, voltage source					
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 100 % 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					
Non-linearity	%	< 0.03					
Data rate, max.	1/s	2400					
Incremental sensor							
Transducers that can be connected		Incremental sensor (up/down counter with zero index signal)					
Power 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					

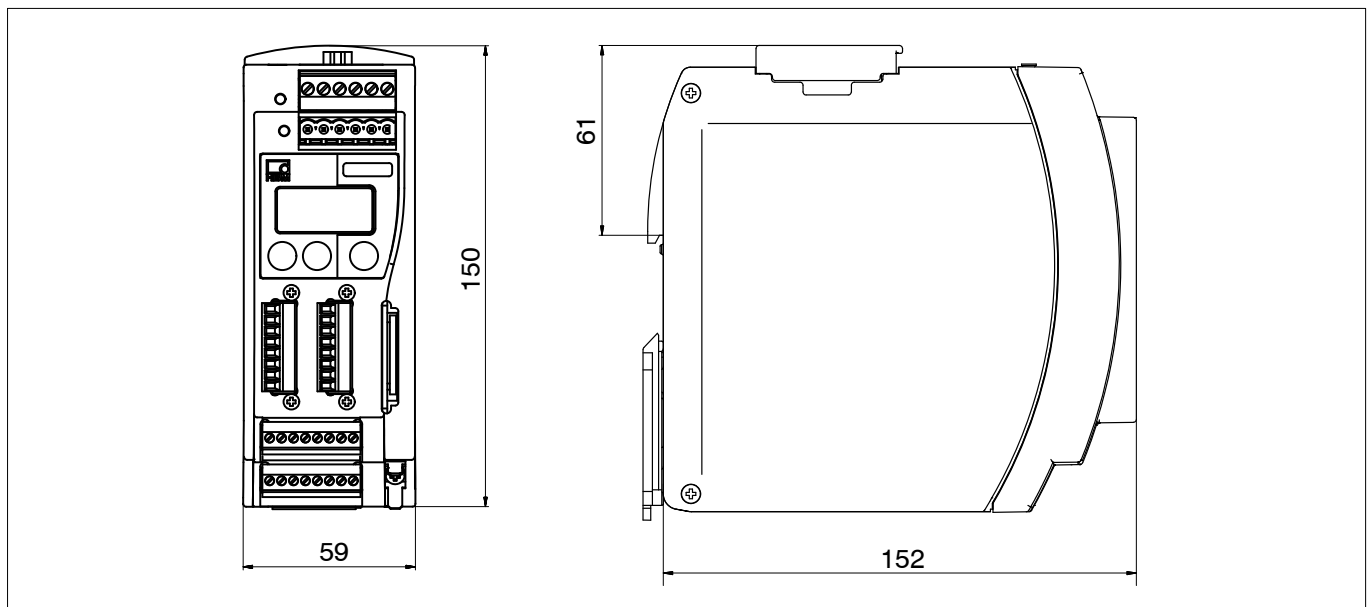
Typical input impedance	kΩ	10
Detection of direction of rotation		via ± 90° phase-shifted signal F2
Input range pulse counting	Pulses	0 ... 999999
Maximum pulse rate	Pulses /s	1,000,000
Interval between 2 successive edges F1(±), F2(±)	ns	> 400
Scaling range, max.	Digits	20 at 1 pulse
Scaling range, min.	Digits	1 at 10000 pulses
Measurement frequency range, adjustable (-1 dB)	Hz	0.05 ... 1000
Data rate, max.	1/s	2400
SSI transducer		
Transducers that can be connected		Displacement and angle transducers with SSI interface
Power 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 feature 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 input (RS422), TTL level 5 V
Differential output voltage CI(±), without load, max.	V	5.8
Differential output voltage CI(±), RL = 50 ohms, min.	V	2
Common-mode voltage at CI (±), max.	V	3
Short-circuit current, clock output CI (±), typical	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
Data rate, max.	1/s	1200
Baud rates	kBaud	100, 200, 500, 1000
Coding		Gray code
Potentiometric displacement transducers		Potentiometric sensors (termination resistance 170 ... 2000 ohms) are supplied with a carrier frequency of 4.8 kHz (see specifications, "Transducer and amplifier")
Notice: If potentiometric sensors of type TR50, TR75 or TR100 from novotechnik are used (termination resistance > 2 kOhms), the accuracy class of the measurement chain changes to 0.25. The same applies to other sensors with a termination resistance of more than 2 kOhms, as the characteristic curve is no longer linear in these cases.		

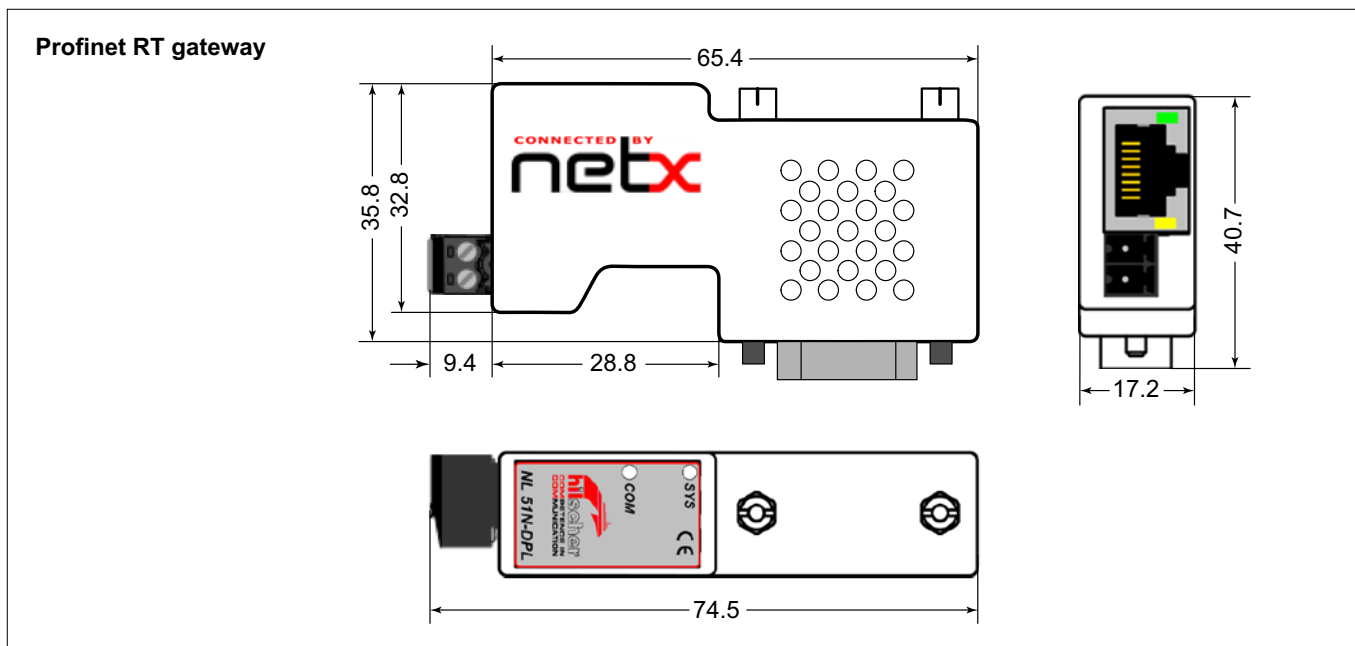
General specifications		
Limit switches		
Number		4 per channel
Reference level		Gross
Hysteresis	%	1 ... 100
Adjustment accuracy	Digits	1
Typical response time (fc=1000 Hz)	ms	< 2
Control outputs		
Number		4 (MP85ADP-S / MP85ADP-PN-S) / 8 (MP85A-S), electrically isolated
Function		Process OK/NOK, Process 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 _{DC}	24
Permissible supply voltage range	V	10 ... 30
Maximum output current per output	A	0.5
Typical short-circuit current (U _{ext.} = 24 V, R _L < 0.1 ohms)	A	0.8
Short-circuit period		unlimited
Control inputs		
Number		1 (MP85ADP-S/MP85ASP-PN-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
Typical input current (High level = 24 V)	mA	12

Interfaces										
Ethernet interface										
Transmission protocol	MBit/s	TCP/IP, can be networked per IEEE802								
Data 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)								
Connector socket		RJ-45								
CAN interface										
Protocol		CAN 2.0B; CANopen-compatible								
Hardware bus link		to ISO 11898								
PDO rate, max.	Measured value(s)	100								
Baud rates	kBit/s	1000	500	250	125	100	50	20	10	
Maximum line lengths	m	25	250	500	1000	600	1000	1000	1000	
Termination resistor		Activated by switch								
Connection		Terminals								
PROFIBUS DP interface (MP85ADP-S only)										
Protocol		PROFIBUS DP slave, to DIN19245-3								
Baud rate, max.	MBaud	12								
Node address		3-123, set via the keyboard								
PROFIBUS Ident Number		Hex 699								
Configuration data	Byte	5								
Parameter data, max.	Byte	6 (+7DP standard)								
Function		Access to and parameterization of all MP85ADP-S functions (remote control)								
Parameterization (asynchronous)		to DPV1 standard								
Input data, max.	Byte	142								
Output data, max.	Byte	40								
Input data update rate	ms	1 (for 4 measured values)								
Output data update rate	ms	< 10, for zero setting, limit values								
Diagnostic data	Byte	48								
PROFIBUS connection		9-pin subD (DIN19245-3), electrically isolated from power supply and measurement ground								
Profinet RT gateway (1-NL51N-DPL), extract										
Function		Proxy for 1:1 conversion of a PROFIBUS slave to a Profinet IO controller								
Mounting		Directly in the PROFIBUS socket of the MP85ADP or MP85ADP-S								
Connector		9-pin subD socket (PROFIBUS), RJ45 connector (Profinet), 2-pin Mini-Combicon (power supply)								
Protocol		Ethernet II, IEEE 802.3								
LED displays		Sys, Com, Link, Rx/Tx								
Processing time	ms	10 ... 20								
Power supply	V _{DC}	18 ... 24 (100 mA at 24 V)								
Nominal (rated) temperature range	°C	0 ... 50								
Weight	g	40								
Dimensions (W x H x D)		48 x 16 x 64								
Emission		CISPR 11 Class A								
Immunity to interference		EN 61131-2:2003								

Memory card		
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
Typical data transmission rate	kBytes/s	2-8
File system		DOS, FAT16 format
Display		
Type		2-line, 8-character alphanumeric, LCD
Keyboard		
		Touch-sensitive keypad with three keys, pressure-sensitive
Temperature range		
Nominal (rated) temperature range	°C	0 ... 50
Operating temperature range	°C	-20 ... +50
Storage temperature range	°C	-20 ... +70
Equipment protection level		
		IP20
Dimensions (W x H x D)		
	mm	59 x 150 x 152
Weight, approx.		
	g	929
Mechanical stress capability(test similar to DIN IEC 60068, Parts 2-6)		
Oscillation (30 min. in each direction)	m/s ²	50 (5 ... 65 Hz)
Impact (3 times in each direction; impact duration 11 ms) (test similar to DIN IEC 60068, Parts 2-27)	m/s ²	200

Dimensions of the PME modules





Scope of supply

- 4 plug-in screw terminals, coded
1x power supply and CAN, 6-pin
2x transducer, 8-pin
1x digital In/Out, 8-pin
- 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 in Windows from version Windows XP, Windows CE and Windows Mobile and later
- EASYMonitor CE (demo version):
Production software for operation via a terminal in the Windows CE operating system
- 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-S/MP85ADP-S/MP85ADP-PN-S process controllers
- SD card memory card (2 GB), e.g. from Transcend (www.transcend.com)

Phoenix order number:
MV STBW 2.5/6-ST-5.08 GY
MCVW 1.5/8-ST-3.81 GY
MC 1.5/8-ST-3.5 GY

HBM order number:
3-3312.0426
3-3312.0422
3-3312.0421

Accessories (not included in the scope of supply):

- Standard ribbon cable, 10-pin, pitch 1.27 mm (HBM order number 4-3131.0037)
- Fieldbus gateway (HBM order number 1-NL51N-DPL) from PROFIBUS to Profinet for operating the MP85ADP with a Profinet RT interface; further interface converters on request

Subject to modifications.
All product descriptions are for general information only. They are not to be understood as a guarantee of quality or durability.

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