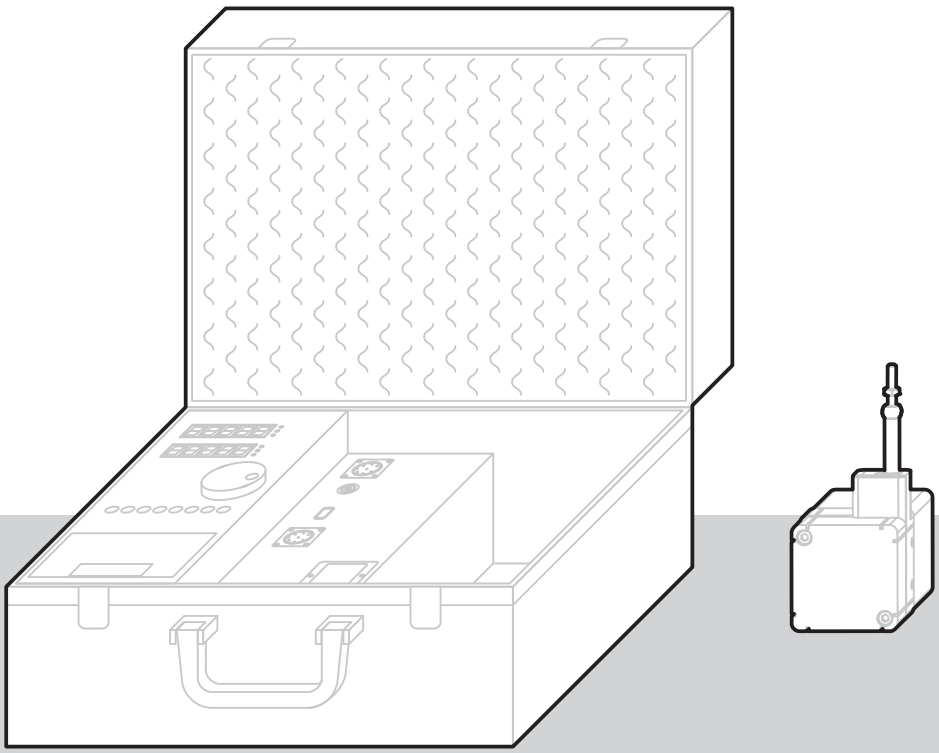
ASM®
perfect in sensors.

NMG2®

Stop-Time Measuring System

Installation and operation manual EN



Please read carefully before installation and operation!
The Instruction Manual for posi**wire**® sensors must be considered!

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1 Safety instructions

1.1 Signal words and symbols



WARNING, Risk of Injury:
Indicates a potentially hazardous situation, which, if not avoided, can result in serious injury or property damage.

⚠ DANGER

WARNING, Risk of Personal Injury or Death:
Indicates a situation that can result in serious personal injury or death if not properly avoided.

⚠ WARNING

WARNING, Risk of Personal Injury or Death:
Indicates a situation that can result in moderate personal injury or death if not properly avoided.

⚠ CAUTION

WARNING, Risk of Personal Injury:
Indicates a situation that can result in minor personal injury if not properly avoided.

NOTICE

WARNING, Risk of Property Damage:
Indicates a situation that can result in minor to major property damage if not properly avoided.

Product liability

- Disregarding the following instructions may result in malfunction, damage to property and personal injury and releases the manufacturer from product liability.

Safety regulations

- National safety regulations must be observed!

1.2 General safety instructions

⚠ WARNING

Risk of injury by the machine to be measured

- Use the stop-time measuring system only in such a way that in the case of malfunction or failure no person can be injured and no machine can be damaged.
- Do not override the safety devices of the machine.

⚠ WARNING

Danger of electric shock when touching the instrument due to faulty connection

- Guarantee that the earthing contact of the line socket is on earth potential.
- Do not attach the stop cable under voltage.

1.3 Intended use

The Stop-Time Measuring System NMG2 is intended to measure stop time, stop distance and velocity of power driven machinery like presses, robots and other machines with user access. For determining measuring ranges, environmental compatibility and connection data of the sensor, please note the data sheet. Use the unit as intended by operating within its specified technical data and ambient conditions.

The installation and operating instructions supplied with the unit must be observed. All maintenance and service work must be carried out. The data sheet of the Stop-Time Measuring System is part of this instruction manual. If yet not available, please request it.

The Position Sensor posi**wire**® must not be improperly mounted, operated or serviced. In addition, operation of the sensor in faulty condition is prohibited.

1.4 Safety instructions for the use of posiwire® Cable Extension Position Sensors

⚠ WARNING

Danger of injury to the operator or damage to the property

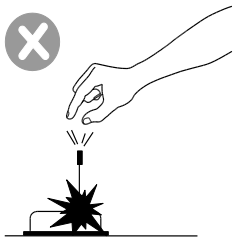
- Connection to power supply must be performed in accordance with safety instructions for electrical facilities and performed only by qualified personnel.
- Any alteration, reconstruction or extension of the sensor is not allowed!
- The sensor must be operated only within values specified in the datasheet.
- The danger of personal injury and danger of property damage due to a malfunction of the sensor in machines or systems must be excluded by additional safety measures.
- In safety-relevant applications, additional facilities must be provided for maintaining safety and preventing damage.
- Check whether the protection class of the sensor is suitable for the application.

⚠ CAUTION

Risk of crushing and cutting injury due to pre-tensioned spring being released from housing when opened!

- Do not open the sensor.

Risk of cutting injury due to uncontrolled retraction of the cable



- Do not damage the measuring cable!
- Do not let the measuring cable and the cable fixing spring back uncontrolled!
- Do not exceed the maximum cable extension range!
- Do not bend the measuring cable!
- Do not let the measuring cable be dragged on objects!

NOTICE

Mechanical damage or destruction of the sensor

- Avoid impact and shock to the sensor.
- Do not allow the measuring cable to spring back uncontrolled.
- Do not pull out the measuring cable beyond the range of the sensor.

Malfunction due to the accumulation of dirt on the measuring cable

- Do not oil or lubricate the measuring cable.

2 Transport and storage

NOTICE

Risk of damage to the measuring cable or cable fixing

- Do not lift the sensor by the cable or cable attachment.

Observe storage and transport temperatures according to the temperatures specified in the data sheet.
Max. rel. humidity 60%, dew condensation must be prevented at all times.
The device must be secured against slipping and tipping during transport.

Unpacking

Check the device after delivery for transport damages. Particularly check the switches, control panels and sockets. If the stop-time measuring system is damaged or if deviations from the specifications contained in this operation manual can be recognized, contact us immediately.

Shipment damages

Check sensor immediately for shipping damage. In case of any damage, please contact your supplier.

Supplied parts



The stop-time measuring system (dimensions: 425 x 325 x 205 mm) is suitable as hand luggage for the airplane transport. The cover of the case may be opened to a maximum angle of 90°. The cover can be removed in the 45° position.

During transport the sensor must be inserted at the intended position. Disconnect the cable from sensor. Shipment only in sufficiently upholstered packing!

- Stop-Time Measuring System NMG2-X in a transportation case – complete equipment see data sheet
- Position Sensor – sensor type see data sheet
- Sensor connector cable WS-KABEL-5M-NMG
- Mains cable NMG2-NETZANSCHLUSSKABEL
- Stop cable NMG-STOPKABEL
- Magnetic clamp MAG1
- Operation manual NMG2
- Operation manual posiwire®
- Keys, 2 pieces
- Spare fuses, 2 pieces: 1 AT, 5 AT

3 Installation and initial operation

Description

The NMG2 perform safety-related measurements of power driven machinery like presses, shears, welders, riveters and robots. In accordance with national and international safety standards machines with dangerous movements have to be equipped with protection devices. The improper placement of a protection device (2-hand control, safety light curtain and so on) will result in the potential for injury of the operator. With the NMG2 all the important measurement values such as stop-time, stop-distance and velocity are provided to calculate the minimum safety distance. The safety distance is defined in national and international standards EN ISO 13855 (EN999). To ensure maximum safety the stop-time measurements have to be repeated periodically (6 months).

The measuring cable of the posiwire® Position Sensor will be connected to the moving part of the machine with the magnetic clamp or a fixing screw. The Sensor sends an incremental pulse signal to the microprocessor controlled counter. The stop position can be selected by a digital encoder. The operator will adjust the stop position of the measurement to the position of max. velocity of the moving part of the machine.

To determine this max. velocity NMG2 provides the following measurement functions:

- Measurement of the max. velocity within the complete movement
- Measurement of the velocity at the stop position
- Measurement of the position of the max. velocity

If the position signal passes through the determined stop position in the selected direction a galvanic isolated contact will cause the stop of the machine and the stop-time measurement will be started. The position measurement values will be recorded until the machine has stopped completely. The two displays of the measuring device will show the measurement values of stop-time and distance. By pressing a button the velocity at the stop position can be displayed. A measurement protocol will be printed. The NMG2 electronics ensures that the measurement is started only at the adjusted stop position and only in the selected direction of motion.

The NMG2 can be used as a comfortable position and velocity measurement system in different applications. The measurement values can be transmitted to a PC or a Laptop via the RS-232 interface and processed with any software. Additional an actuator can be controlled to interrupt a safety light curtain, so that it is not necessary to insert the relay contact into the machine circuit.

Special Characteristics

- Easy to use
- Portable and solid equipment
- Built-in matrix printer (option)
- Built-in RS-232 interface
- Fast set-up time
- Traceability of measurement values
- ISO9000 Calibration certificate
- Adjustable stop point
- Standstill detection down to v < 1 mm/s
- Measurement of max. velocity
- Measurement of velocity at stop point
- Measurement of rotary tables

Specifications

Measurement function Stop-Time	
Measurement range	0 ... 5000 ms
Resolution	1 ms
Accuracy of time base	0.5 ms -0.05 %
Stability of time base	±50 ppm / K
Relay compensation	Time delay of release contact will be compensated at every measurement
Standstill detection	v < 1 ... 10 mm/s; default: 10 mm/s
Measurement function: Position	
Measurement range	-2500 ... +2500 mm (standard) -9999 ... +9999 mm (maximum) measurement ranges of sensor up to 30000 mm
Determination of stop point	-9999 ... +9999 mm
Resolution of measuring device	up to 0.1 mm
Resolution of sensor	25 µm
Accuracy	±0.05 % f.s. ± 1 digit
Influence of temperature	±0.005 % f.s. / K
Measurement function: Velocity	
Measurement range	-9999 ... +9999 mm/s
Resolution	2.5 mm/s
Accuracy	±2.5 mm/s
General specifications	
Displays	2 x 4-digit LED with sign
Trigger output	Logic signal 5 V, High → Low at stop point
Stop contact	NC / NO 230 V AC / 5 A
Fuse protection of stop circuit	5 A slow-blow
Supply voltage	100 ... 240 V AC, 50/60 Hz
Power consumption	30 W max.
Fuse protection mains	1 A slow-blow
Dimensions	425 mm x 325 mm x 205 mm
Weight	10.5 kg incl. case
Operating temperature	0 °C to 40 °C
Humidity	80 % R.H. max., non-condensing
EMC	EN 61326-1:2006
Options (further options see data sheet NMG2)	Built-in matrix printer NMG2-2500-P
	Measurement ranges from 1250 to 30000 mm
	Actuator to release no-touch safety equipment
	USB/RS-232 cable and PC software
	Adjustable standstill detection

3.1 Electrical connection

Check before the first operation

- Make sure that supply voltage indicated on the device corresponds with the supply network. Check likewise the assigned fuse.
- Replace the fuse only with the type indicated in the operation manual.

Grounding link

- Use only plug sockets with mains protection. Guarantee that the earthing contact of the plug socket is on earth potential.

⚠ WARNING **Danger of electric shock when touching the instrument due to incorrect connection**

- Make sure that the earthing contact of the plug socket is on earth potential.
- Do not connect the stop cable under voltage.

Electrical connection of posiwire® Cable Extension Position Sensors

NOTICE **Damage or destruction of the sensor due to excessive operating voltage or mounting error**

- The applied operating voltage must not exceed the value specified in the data sheet.
- Operate the sensor only within the limits specified in the data sheet.
- Connect to the power supply only by qualified personnel and in accordance with the applicable safety regulations for electrical equipment.
- Do not connect or disconnect the sensor under voltage!

Corrosion in the sensor due to moisture penetration

- Use the sensor only according to protection class.
- The mating connector should have the same protection class as the sensor, otherwise the lower IP rating of the mating connector is valid.
- Avoid crossing the dew point.
- Cable outputs must be installed in such a way that no moisture can get into the cable.
- The protection class of sensors with connector output is valid only if the electrical plug is connected!

Damage of the sensor cable due to mechanical stress

- Do not twist the M12/M8 connector inserts.
- It is important that the knurled nuts on the connectors are tightened to the correct torque for each different size of the connector:
  - M8-ASM connectors / couplings: 0.6 Nm
  - M12-ASM connectors / couplings: 1.0 Nm
  - connectors / couplings of other manufacturers: according to manufacturer instruction.
  - Use a torque wrench.
- Do not strain the connection cable.
- A separate cord grip is recommended.

3.2 Initial operation

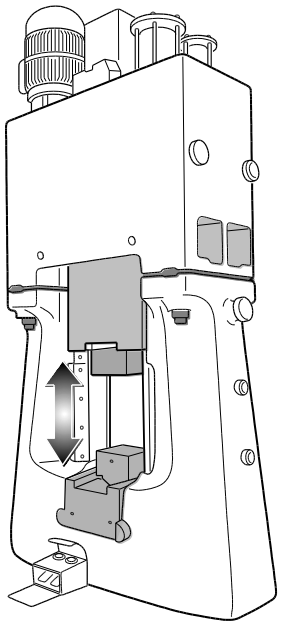
⚠ CAUTION

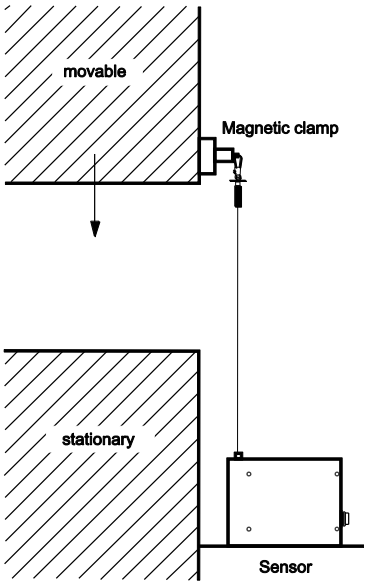
Risk of crushing and cutting injury due to the movement of the measuring cable or to moving machine parts during operation

- Operate the measuring instrument only in such a way that no danger for persons or machines can occur.
- The measuring cable must not be oiled or lubricated. Do not break the cable!
- Do not let the measuring cable and the cable fixing spring back uncontrolled!
- Do not exceed the maximum cable extension range! (see Instruction Manual for Cable Extension Position Sensors posiwire®).
- Operate the device only at plug sockets with protective ground.
- Replace fuses only with the type indicated in the operation manual.
- Do not override the safety devices of the machine.
- In the **ADJUST** mode no stop signal will be released.

Preparation

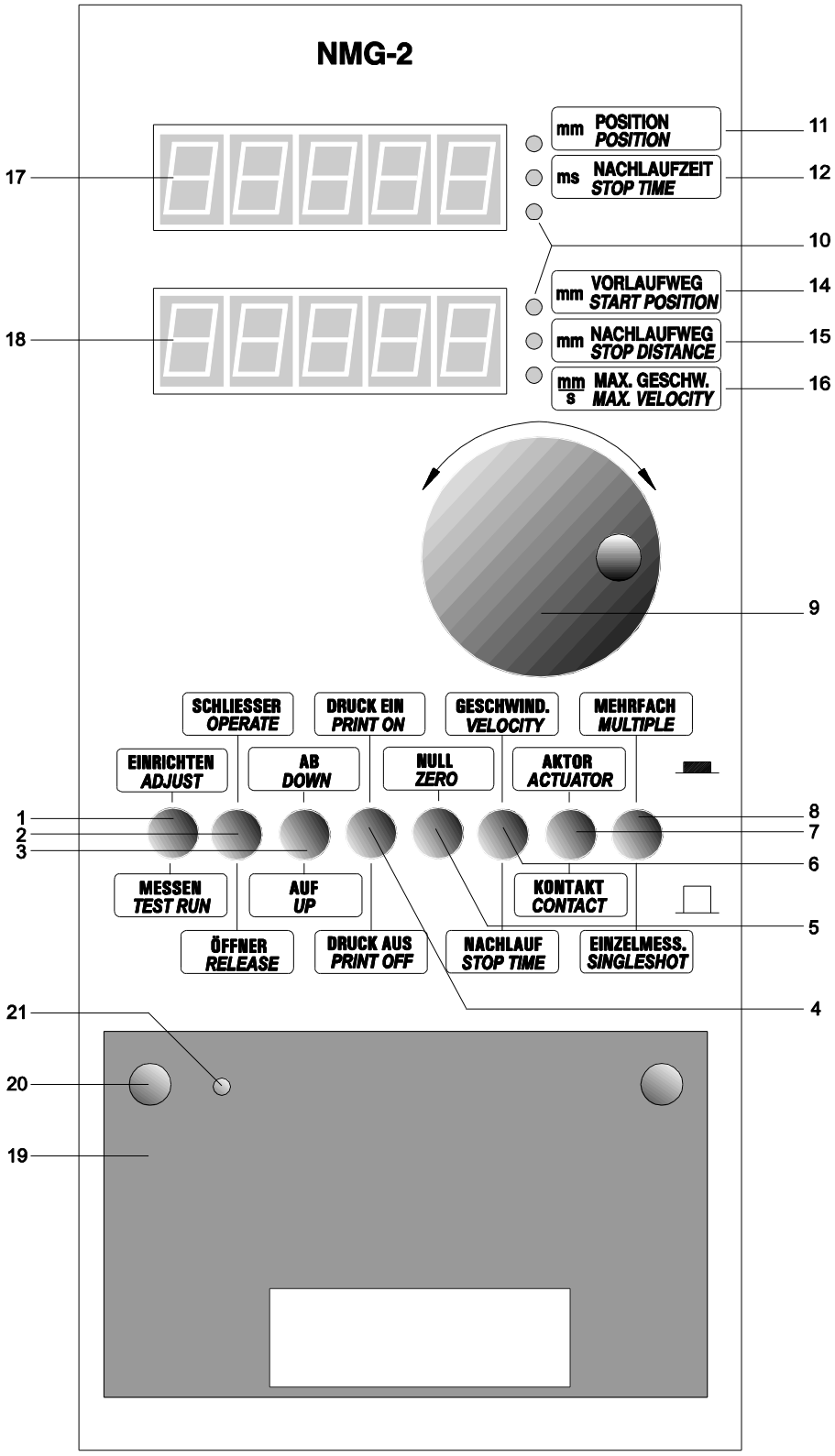
1. Connect the Stop-Time Measuring System and the posiwire® Cable Extension Position Sensor with the 8-wire sensor cable.
2. The connection of the cable clip to the moving part of the machine to be tested is made with the magnetic clamp or an eye. Do not let the cable snap back! Note that the applicable force on the magnet is reduced in the case of tangential force or on coated (paint) or uneven surfaces. Mount the sensor on a plain base (see figure below). Note that a cable misalignment will cause measurement errors!
3. Make sure that the machine is switched off and connect the stop cable (2 wire) into the safety circuit of the machine and connect the other end with the stop cable connector [25] of the NMG2.
4. Connect the power supply with the line socket and make sure that the earthing contact of the plug socket is on earth potential.
5. Switch on the machine.
6. Switch on the Stop-Time Measuring System.





4 Operation

Controls and Displays



Identification of Controls and Displays

[1] TEST RUN/ADJUST

This button offers a reset function in the ADJUST position. The values of stop time and stop distance will be set to zero and the stop contact is in normal position. The machine can be operated and no measurement will be performed. Measurement will be started in the TEST RUN position only.

[2] RELEASE/OPERATE

This button sets the function of the potential-free stop contact looped into the stop circuit of the machine (OPERATE or RELEASE). In most cases the RELEASE function is used. This button must be set before starting measurement!

[3] UP/DOWN

Toggles the measuring direction.

UP = pull out measuring cable = positive counting.

[4] PRINT ON/PRINT OFF

Switches the built in printer on or off.

[5] ZERO

Sets the measuring system to zero.

[6] Velocity measurement (Vmax)

In the VELOCITY MEASUREMENT mode the max. velocity and the corresponding position can be measured.

[7] The Actuator Option

An actuator to break safety light curtains is available as an option.

[8] Automatic Measurement Mode

In the automatic measuring mode, it is possible to perform any number of measurements without pressing the key ADJUST/TEST RUN. After each measurement, the stop contact is set to the normal condition automatically and the machine can be moved. If the machine passes the stop point in the opposite direction the measurement data will be deleted and the NMG2 is ready for the next test run.

[9] Jog wheel

With the jog wheel the stop position of the stop-time measurement can be set. Example: The moving part of the machine, e.g. a press, is in the top dead center and the wheel is turned until the stop-point display [18] shows -500. That means that the measurement will be started 500 mm below the top dead center of the machine. The result of the measurement will be shown as a negative value because of the downward movement.

[10] LED Indicators

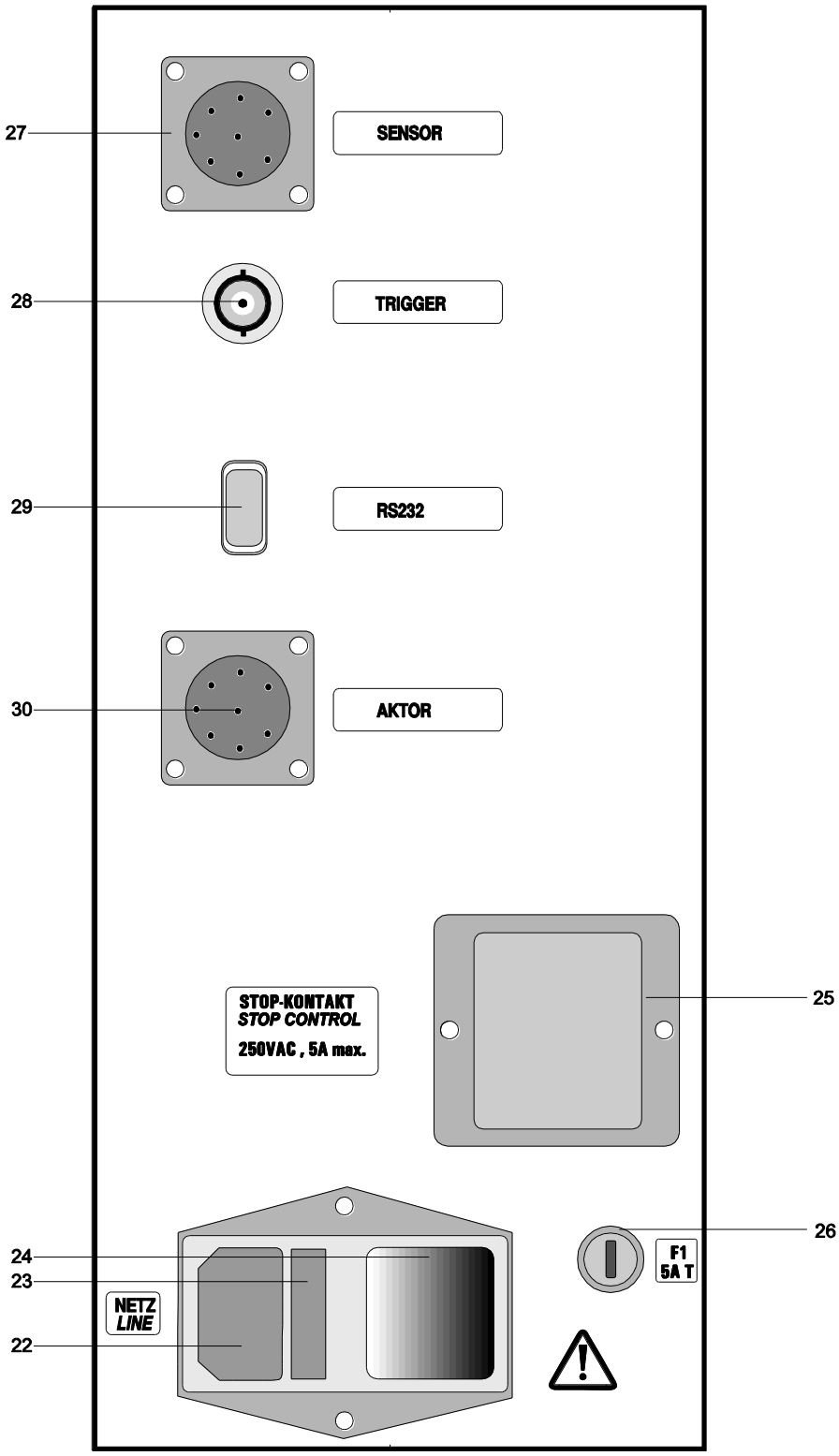
Assignment of display and shown parameter.

[11] ... [16] Definition of the measurement displays.

[17], [18] Displays 4 digits + sign.

[19] ... [21] Protocol printer

Connectors


27
SENSOR
28
TRIGGER
29
RS232
30
AKTOR
STOP-KONTAKT
STOP CONTROL
250VAC , 5A max.
25
24
23
22
NETZ
LINE
F1
5A T
26

Identification of connectors

22] Mains connector.

[23] Mains fuse 1 A slow blow.

[24] Mains switch.

[25] Connector for stop cable to be connected into the safety stop circuit of the machine.

[26] Fuse F1 for the stop control circuit, 5 A slow blow.

[**27] Connector for the posiwire® Position Sensor or friction wheel encoder**, 8 pin DIN socket.

[28] Trigger output
The signal changes its potential from logical 1 to logical 0 (+4,5 V to 0 V DC) if the stop control is released. The signal can be used to trigger data recorders or other registration devices.

[29] PC connector RS-232
The measurement data can be transmitted to the PC in ASCII format and processed there.
Recommended software: NMG2-RS232/USB-PROSOFT.

[30] Actuator connector
The actuator causes the interruption of light curtains and light barriers.

4.1 NMG2 basic settings

There are two ways of opening the menu for basic settings:

1. NMG2 switched off: set the button [1] in the **ADJUST** position, keep the **ZERO** button [5] pressed – the NMG2 will be switched on.
2. NMG2 switched on: set the button [1] in the **ADJUST** position, keep the **ZERO** button [5] pressed and set the button [1] in the position **TEST RUN**, then release the **ZERO** button [5].

Both displays show the message FUNC/END. Turn the jog wheel [9] clockwise until the display shows FUNC. Select the needed function and press the **ZERO** [5] button. The set function will be saved; then leave the display FUNC;END.

Basic setting of the formula parameters

FUNC;END ⇒ gr

Turn the jog wheel [9] clockwise until [gr] will appear. Press the **ZERO** [5] button to achieve the setting mode for the hand speed, which can be adjusted now with the jog wheel. Then press the **ZERO** [5] button. Now FUNC;END appears again.

FUNC;END ⇒ t2

Turn the jog wheel [9] clockwise until [t2] will appear. Press the **ZERO** [5] button to achieve the setting mode for the addition to the stop time, which can be adjusted now with the jog wheel. Then press the **ZERO** [5] button. Now FUNC;END appears again.

FUNC;END ⇒ F1

Turn the jog wheel [9] clockwise until [F1] will appear. Press the **ZERO** [5] button to achieve the setting mode for the proportional addition factor for stop time, which can be adjusted now with the jog wheel. Then press the **ZERO** [5] button. Now FUNC;END appears again.

FUNC;END ⇒ F2

Turn the jog wheel [9] clockwise until [F2] will appear. Press the **ZERO** [5] button to achieve the setting mode for the addition to the safety distance, which can be adjusted now with the jog wheel. Then press the **ZERO** [5] button. Now FUNC;END appears again.

Number of measurements in automatic mode

FUNC;END ⇒ n

Push briefly the **ZERO** button [5] to achieve the setting mode for the number of measurements in automatic mode, which can be adjusted now with the jog wheel [9]. For n=0 the automatic measurement mode will be terminated by pressing **ADJUST**. According to ISO 13855 the preset is n = 10. Then press the **ZERO** button [5]. Now FUNC;END appears again.

Selection of the measurement type

FUNC;END ⇒ Fcod

Push briefly the **ZERO** button [5] to achieve the setting mode for the selection of the measurement type, which can be adjusted now with the jog wheel [9]:

- Bi-dir: bidirectional standard measurement mode for measurements on presses etc.
- Uni-dir: unidirectional measurement mode for continuous movements (e.g. conveyors, rotary tables)
- AUto rES: like Uni-dir, but the **ZERO** button [5] must be pressed for a new measurement NULL [5]
- ES24 for measurements on systems with emergency stop or 2-hand control using the switch NMG2-KABEL-ES24V

Then press the **ZERO** button [5]. Now FUNC;END appears again.

While using first set up method, i.e. when NMG2 is switched off, the following parameters will also be available:

Realtime clock

FUNC;END ⇒ FUNC;ddtt

Push briefly the **ZERO** button [5] to achieve the setting mode:

1. d;31 ⇒ set the day (e.g. 31) with the jog wheel [9] and push briefly the **ZERO** button [5]
2. dd;7 ⇒ set the month (e.g. July=7) with the jog wheel and push briefly the **ZERO** button [5]
3. ddd;19 ⇒ set the year (e.g. 19) with the jog wheel and push briefly the **ZERO** button [5]
4. tt;16 ⇒ set the hour (e.g. 16) with the jog wheel and push briefly the **ZERO** button [5]
5. t;24 ⇒ set the minutes (e.g. 24) with the jog wheel and push briefly the **ZERO** button [5]

When the display shows FUNC;END then push the **ZERO** button [5] to return to the **ADJUST** mode..

The NMG2 has a real-time clock with backup battery. During each measuring process the current date and time are stored. On the printout and via the serial data communication date and time are displayed.

Language selection

FUNC;END ⇒ LnCo

Push briefly the **ZERO** button [5] to achieve the setting mode for the language selection, which can be adjusted now with the jog wheel [9]:

1 ⇒ German

2 ⇒ English (mm)

3 ⇒ English (mm and inch)

Standstill velocity

FUNC;END ⇒ Stop

Push briefly the **ZERO** button [5] to achieve the setting mode for the standstill velocity, which can be adjusted from 1 to 10 (mm/s) with the jog wheel [9]. Default value: 10 mm/s.

4.2 Input of a Protocol ID (machine number)

In the **ADJUST** mode the user can input a freely selectable 8-digit protocol ID. This protocol ID appears in the printout and in the RS-232 transmission protocol if not zero.

Procedure

Press the **ZERO** [5] button in the **ADJUST** mode. At one display [17,18] three LEDs light up. This display can be adjusted with the jog wheel [9]. Press **ZERO** [5] again and hold it, now the second display can be adjusted.

The upper display [17] shows the first 4 characters and the lower display [18] the last 4 characters of the ID.

Now the protocol ID appears in the printout.

4.3 Stop-Time Measurement

1. **Configuration of the machine**
   Press the [1] button, "**ADJUST**" active
2. **Set the Stop Contact or the Acutator (Aktor) as described in** (see page 25)
   Button [2] released: "**RELEASE**" active; the safety circuit of the machine is closed and will be interrupted at the Start Position (see 8.).
   Button [2] pressed: "**OPERATE**" active; the safety circuit of the machine is open and will be closed at the Start Position (see 8.).
3. **Select the measuring direction**
   Button [3] pressed: downward measurement, "**DOWN**" active, pulling in the measuring cable corresponds with the **DOWN** direction and will cause negative counting.
   Button [3] released: upward measurement, "**UP**" active, pulling out the measuring cable corresponds with the **UP** direction and will cause positive counting.
4. **Set the printer**
   Button [4] pressed: "**PRINT ON**", printer activated
   Button [4] released: printer deactivated
5. **Set the machine to ZERO**
   Arrange the machine in the upper or lower dead center and set to zero using the button [5] "**ZERO**.
6. **Activate "Stop-Time measurement" mode**
   Button [6] released: "**STOP TIME**" active
7. **Set Single/multiple measurement**
   Button [7] pressed: "Automatic measurement" mode, "**MULTIPLE**" active
   Button [7] released: "**SINGLESHOT.**" mode active
8. **Select the Start Position of the measurement**
   Adjust the "**START POSITION**" (lower display) with the jog wheel [9], this is usually the half of the whole movement.
   Button [3] pressed: negative value
   Button [3] released: positive value
9. **Prepare the machine for the measurement**
   Button [1] released, Mode "**TEST RUN**" is active, 4 bars appear on the display.
10. **Let the machine perform the complete cycle (e.g. with the 2-hand control).**
11. As soon as the moving part of the machine passes the determined stop position the stop contact will cause the stop of the machine. After the NMG2 has detected the complete standstill of the machine, it will display the parameters Stop Time and Stop Distance in the upper resp. lower display. The printout starts, if selected.

In the automatic measuring mode, any number of consecutive measurements can be carried out. The safety distance measurement will be determined only in this measuring mode.

4.4 Velocity Measurement

Steps 1 to 5: proceed as in the case of Stop-Time measuring

6. **Activate velocity measurement**
   Button [6] pressed: "**VELOCITY**" active
7. **Set the parameters for the velocity measurement**
   Button [8] is always released during the velocity measurement, "**SINGLESHOT.**" active
   Adjust the "**START POSITION**" (start of measurement) with the jog wheel [9]. The recommended value is +2 mm for upward movement and -2 mm for downward movement.
8. **Activate the measuring mode**
   Now release the button [1], "**TEST RUN**" is activated, 2 bars appear on the display, NMG2 is ready for the measurement.
9. **Let the machine perform a complete cycle**
10. **Read the measurement value**
    After the machine has stopped, press and release the button **ZERO** [5] to obtain the measurement values. The max. velocity will be shown on the lower display **"MAX. VELOCITY"** [18] and the corresponding position will appear on the upper display **"POSITION"** [17].

The printout shows the maximum speed between the start position and the complete standstill of the machine. The actual speed in the start position also appears on the printout, so that the speed at each point of the stroke can be determined by adjusting the start position.

4.5 Printer protocol

As an option the NMG2 can be equipped with a protocol printer. With the button PRINT ON [4] the printer can be activated. After a test run the measurement data will be printed. It is possible to print the data after a measurement or the same printout again by pressing the button [4]. Setting button [1] to ADJUST clears all measurement data and a printer output is not possible any longer.

The button [21] causes the printer paper feed. During printing a paper feed is not possible. If the printer output is started, the printing cannot be aborted.

Protocol Stop Distance Measurement – Single Measurement

```
Stop-Time Protocol:
NMG2-V05.23, ASM GmbH
Date:  31.01.2019
Time:  14:57:35
--- Setup Values ---
Protocol Id: 00250056
Start Pos.:      50 mm
V Standstill:    10 mm/s
Direction:  outwards
Relay Contact: release
----- Result -----
Stop-Time:      497 ms
StopDist:     199.1 mm
V-Startpos.:    890 mm/s
-- Back Movement --
STT-Abs:        497 ms
StopPos-Abs:      0 mm
Back-Pos.:      256 mm
Check for Minimum
Safety Distance !
```

→ 0.
→ 1.
→ 2.
→ 3.
→ 4.
→ 5.
→ 6.
→ 7.
→ 8.
→ 9.
→ 10.

0. Protocol ID (can be set by the customer, see chapter 4.2 Input of a Protocol ID (machine number) on page 17).
1. Adjusted measurement start position. At this point the contact will be released and the measurement will be started.
2. A velocity value lower than indicated will be detected as standstill. This velocity can be programmed by the manufacturer between 1 ... 10 mm/s. Thus, very slow machines can also be measured. Standard adjustment ex-factory is 10 mm/s.
3. Adjusted measuring direction
4. Adjustment of relay contact
5. The measured stop time
6. The measured stop distance with a resolution of 0.1 mm
7. Velocity at start point

If the NMG measuring system detects a return movement or an oscillation when the machine is stopped, the following values will be additionally calculated and printed in single measurement mode :

8. Time to final standstill
9. Position of the final standstill
10. Maximum position achieved in return direction

Protocol Stop Distance Measurement – Automatic Measurement

```
Stop-Time Protocol:
NMG2-V05.23, ASM GmbH
Date:  31.01.2019
Time:  14:58:13
--- Setup Values ---
Protocol Id: 00250056
Start Pos.:      50 mm
V Standstill:    10 mm/s
Direction:  outwards
Relay Contact: release
Gr =  2000 mm/s
F1 =   100 %
F2 =     0 mm
t2 =     0 ms

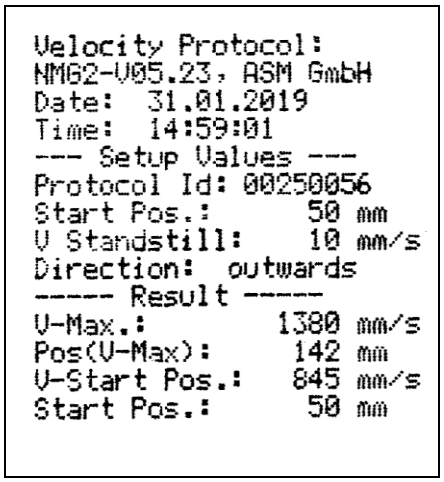
Nr.    STT    STD   V-St
        ms     mm   mm/s
  1    344  223.5    612
  2    490  269.1    570
  3    385  243.2    575
  4    360  242.4    647
-----------------------
MAX    490  269.1    570
MIN    344  223.5    612
--- Safety Distance ---
Safety Dist.:     980 mm
Check for Minimum
Safety Distance !
```

→ 0.
→ 1.
→ 2.
→ 3.
→ 4.
→ 5.
→ 6. / 7. / 8.
→ 9.

0. Protocol ID (can be set by the customer, see chapter 4.2 Input of a Protocol ID (machine number) on page 17).
1. Adjusted measurement start position. At this point the contact will be released and the measurement will be started.
2. At this velocity standstill will be detected. This velocity can be programmed by the manufacturer between 1 ... 10 mm/s. Thus, very slow machines can also be measured.

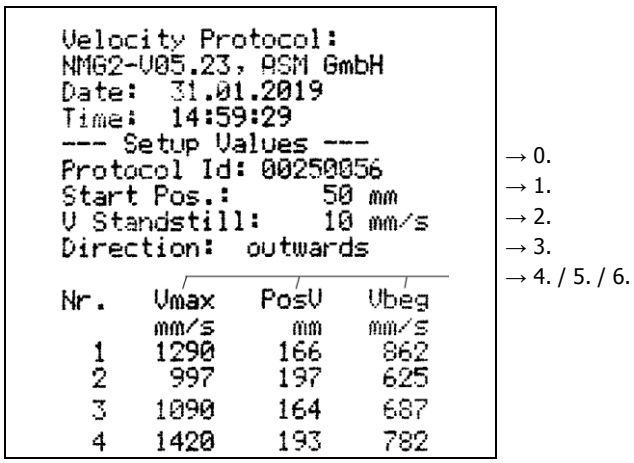
   Standard adjustment ex-factory is 10 mm/s.
3. Adjusted measuring direction
4. Position “RELEASE”
5. Parameters to calculate the safety distance ((see page 23))
6. Stop time
7. Stop distance
8. Velocity at the start of measurement
9. Calculated safety distance.

Protocol Stop-Time Measurement – Single Measurement



0. Protocol ID (can be set by the customer, see chapter 4.2 Input of a Protocol ID (machine number) on page 17).
1. Adjusted measurement start position
2. The velocity (independently of the sign), where standstill of the machine will be detected
3. Adjusted measuring direction
4. The max. velocity occurred after the start of measurement
5. The position where the highest velocity was achieved
6. The velocity at the start position
7. Adjusted start position

Protocol: Stop-Time Measurement – Automatic Measurement



0. Protocol ID (can be set by the customer, see chapter 4.2 Input of a Protocol ID (machine number) on page 17).
1. Adjusted measurement start position
2. The velocity (independently of the sign), where standstill of the machine will be detected
3. Adjusted measuring direction
4. Max. velocity
5. Position of the max. velocity
6. Velocity at the start point

4.6 Calculation of the Safety Distance

Safety Distance

The minimum safety distance for 2-hand guards or safety light curtains is calculated as a product of the machine stop-time and a determined maximum hand speed. The actual valid safety regulations (EN ISO 13855, EN999 etc.) have to be regarded. The stop-time measurement must be made at the worst conditions of the machine to determine the maximum stop-time and the correct safety distance.

Calculation of the Safety Distance

(presentable via printer or RS-232)

In the automatic measurement mode (**MULTIPLE** [8] pushed) the safety distance of the safety equipment (2-hand control, light curtain etc.) can be calculated. If the hand speed is not zero in the basic setting, the safety margin is calculated from the max. stop time. A number of measurements can be set.

The following formula is used:

s = gr · (t1 · F1 + t2) + F2 with

s = Safety distance in mm
gr = approach speed (adjustable in steps of 100 mm/s).
t1 = Measured stop time
F1 = Proportional addition factor for stop time (adjustable from 100 up to 200 %).
Designated as [F1] in the basic setting
F2 = Addition to the safety distance (adjustable in steps of 10 mm)
t2 = Addition to the stop time (adjustable in steps of 10 ms)
Corresponds to the reaction time of the safety equipment.

Examples:

The up-to-date valid standards and minimum safety distances must always be observed.

1. 2-hand control with cover (see EN ISO 13855)
gr = 1600 mm/s; F1 = 100 %; F2 = 0 mm; t2 = 0 ms

2. Light curtain with a resolution ≤14 mm (see EN ISO 13855)
gr = 2000 mm/s; F1 = 100 %; F2 = 0 mm (depending on the sensor detection ability); t2 = 20 ms (resp. other reaction time of the ESPE*).
* Electro Sensitive Protective Equipment

3. Interlocking device associated with guards (see EN ISO 13855)
gr = 1600 mm/s; F1 = 100 %; t2 = 0 ms; F2 = 0 mm (depending on the aperture)

Automatic Measurement with Safety Distance Calculation

Set the NMG2 in the automatic measurement mode (**SINGLESHOT/MULTIPLE** pressed, button **TEST RUN/ADJUST** released). The printout shows the header with the assigned formula parameters. Start the machine. The machine will be stopped and the stop contact will be released. Proceed to the assigned number n of measurements, then terminate the automatic measurement by setting the **button TEST RUN/ ADJUST** to the **ADJUST** position. Minimum and maximum stop time will be determined and printed. The safety distance will be calculated by the max. stop time and the given formula parameters and then be printed.

4.7 Option Friction Wheel with encoder

– for measurements of continuous movements

Stop-time measuring system with internal memory **NMG2-...-MEM** in operation mode Multiple Measurement.

In this mode you can select the unidirectional measurement. This has an effect on the sequence of the Multiple Measurement but has no effect on the Single Shot mode.

Mode of operation [uni-dir]

After measurement, the new zero position will be set at the standstill position. Now move in the measuring direction to the start position and start the next measurements.

Mode of operation [Auto-rES]

After measurement, the new zero position will be set by pushing the **ZERO** [5] button. Now move in the measuring direction to the start position and start the next measurements.

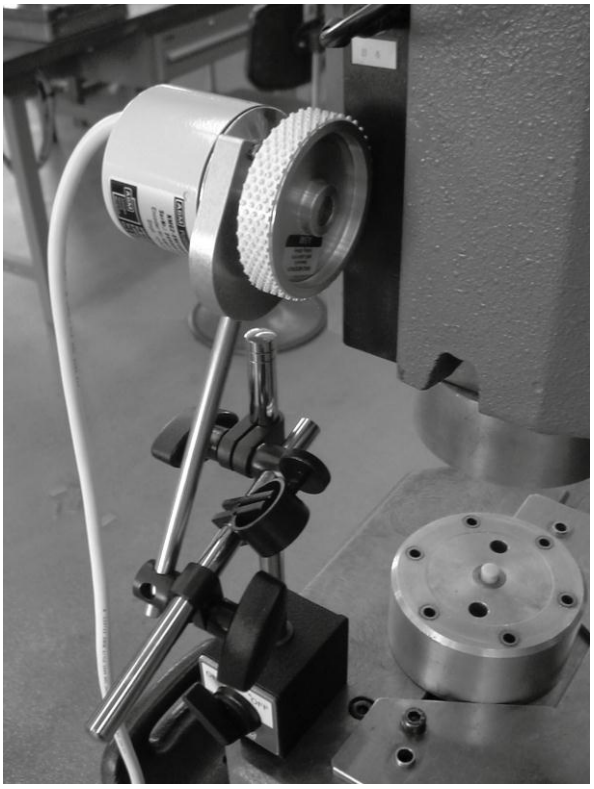
Applications

For measurements on machines with continuous movements (conveyor belts, rotating tables) you can perform multiple measurements in series.

The stop-time of presses in dependency of the position between upper and lower dead center can be measured in one single measurement.

To select the mode, use the setting of the parameters (see page 16):

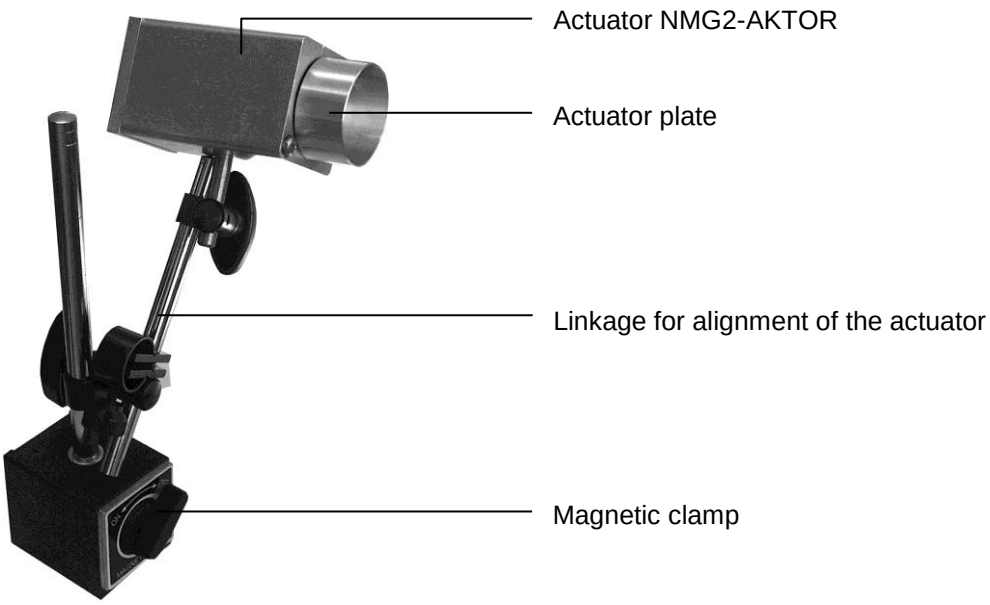
1. Set [Fcod] with the jog wheel [9]
2. Press ZERO [5]
3. Select Unidirectional with [Uni-dir] or [Auto-rES] (back to standard mode with [Bi-dir]).



4.8 Actuator Option

Description

The Actuator option will be used to release no-touch safety equipment (light curtains, light barriers and so on). In the actuator mode, the actuator plate will be extended 10 mm into the active area of the safety equipment if the machine passes the start position. This will cause the stop of the machine. The measurement will be started. After standstill of the machine the measurement values will be printed.



Assembly and adjustment

Switch [7] pressed: "AKTOR" active; switch [2] released: "ÖFFNER" active;

Fasten the actuator NMG2-AKTOR to the linkage of the magnetic clamp and connect it to the AKTOR socket using the WS-KABEL-5M-NMG. Attach the magnetic clamp to a ferromagnetic machine part in such a way that the actuator plate can move into the protection area. Use the linkage to align the actuator plate so that the protective device just does not trigger. For testing you can press the switch [2] and extend the actuator plate.

Test Run

The execution of the measurement takes place as shown in previous chapter (see page 18). When passing the starting point, the actuator will be released and the machine is forced to standstill. The result of the measurement is displayed and printed out if necessary.

4.9 Interface RS-232- / PC connection via USB/RS232

Description

This interface can be used to transmit the measurement data to the PC. The data can be received on a PC using a ASM-Software „NMG2-USB/RS232-PROSOFT“ and then stored, evaluated and presented in diagrams. In addition, a PDF printout of the measurement diagrams can be generated.

4.10 Option Printer

Material

Printer paper, 1 roll	NMG2-DP
Printer ribbon, 1 piece	NMG2-DF

Ribbon and Paper Replacement

NOTICE

- To change the paper roll or the ribbon cartridge the printer module must be removed.
- Make sure that the NMG2 is switched off.

1. Remove the front plate

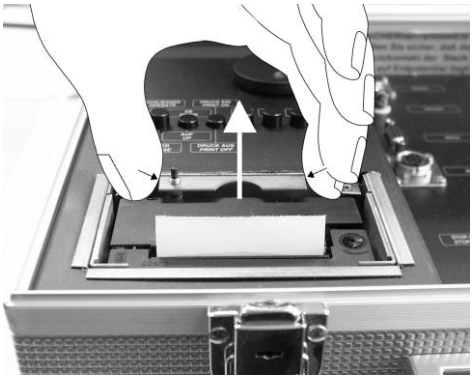
Detach the knurled screws [20] and remove the front plate [19].

2. Replacement of the ribbon cartridge

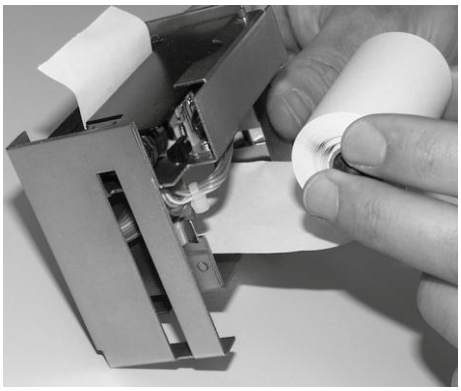
To change the ribbon cartridge, push the edge of the old cartridge on the right-hand side, there´s written PUSH and EJECT. The cartridge will come loose at the right-hand side and can be removed. Tighten the ribbon of the new cartridge by turning the small wheel on the right-hand side of the cartridge in the direction of the arrow. Lead now the ribbon cartridge across the paper. The paper must be between the textile ribbon and the plastic bar. Be sure that the cartridge is engaged in the correct position.

3. Replacement of the paper roll

The housing is suitable for paper rolls of 38 mm diameter. Grip the bracket plate with the form feed key with thumb and index finger.



Pull the printer module completely upward from the housing. Remove the ribbon cartridge as described in step 2. Take the spindle with the core of the empty roll and set the spindle into the core of the new paper roll. Set the paper roll into the housing in such way that the paper unwinds downward in the back and let the strip of paper come out of the window to the front.



If necessary, cut off straight the end of the paper strip. The end of the paper must be inserted from the bottom into the designated slot at the printer unit until a noticeable resistance appears. Now turn the rubber roller in the center of the unit until the paper comes out of the printing mechanism approx. 5 cm. Install the ribbon cartridge as de-scribed in step 2. Now push the printer unit back into the housing. Make sure that the surface is plain, so a correct electrical connection is achieved.

4. Assembly of the Front Plate

Insert the end of the paper roll from the rear through the slot of the front plate. Fasten the front plate with the knurled screws [20].

4.11 Error numbers

If an operation or device error occurs the NMG2 will show an error number in the lower display [18].
The error number can be deleted by pressing the button **ADJUST/TEST RUN** [1] or switching off the device.

Meaning of the error numbers

Error number	Description
11	Line interruption: The NMG2 has detected a line interruption.
12	Printer error: The built-in printer doesn't respond.
51	Measurement aborted: After the start of the measurement the measurement has been aborted by the user.
52	Measuring time too long: No standstill within the max. measurable stop time (5 s).
53	Measurement velocity: The permissible measurement velocity was exceeded.
54	Measurement acceleration: The permissible measurement acceleration was exceeded.
91	RAM error: A defective memory cell has been found.
92	Relay feedback: The relay is not in the defined switching state. Relay is defective.
93	Relay time: The max. permissible relay switching time was exceeded. Relay is defective.
94	Actuator not connected (actuator button pushed) Actuator is defective.
95	Actuator slow Switching is time too long.

5 Maintenance and disposal

5.1 Maintenance and repair

Fuse replacement
When replacing the fuse, only the following fuse types may be used:

Fuse protection mains	1A, T
Fuse protection of stop circuit	5A, T

Repair

- Do not open the stop-time measuring instrument. Opening the device means the loss of the warranty claim.
- Periodical maintenance of the stop-time measuring instrument is not necessary.
- Before starting the measurement ensure that the sensor cable is free from dust and grease and not damaged.

⚠ CAUTION

Risk of injury when opening the device or the sensor

- Due to possible risk of injury by improper handling, we strongly advise against repair attempts.

Calibration
The stop-time measuring instrument was calibrated at the factory. It should be re-calibrated at least once per year. A traceable certificate can be provided.

5.2 Disposal

Disposal of the Stop Time Measuring System and posiwire® sensor according to applicable government regulations.

perfect in sensors.

www.asm-sensor.com

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