# Rolling mill measurement system
# System overview


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# Feature

- High reliability
- High precession measurement
- Long life
- Magnetic principle


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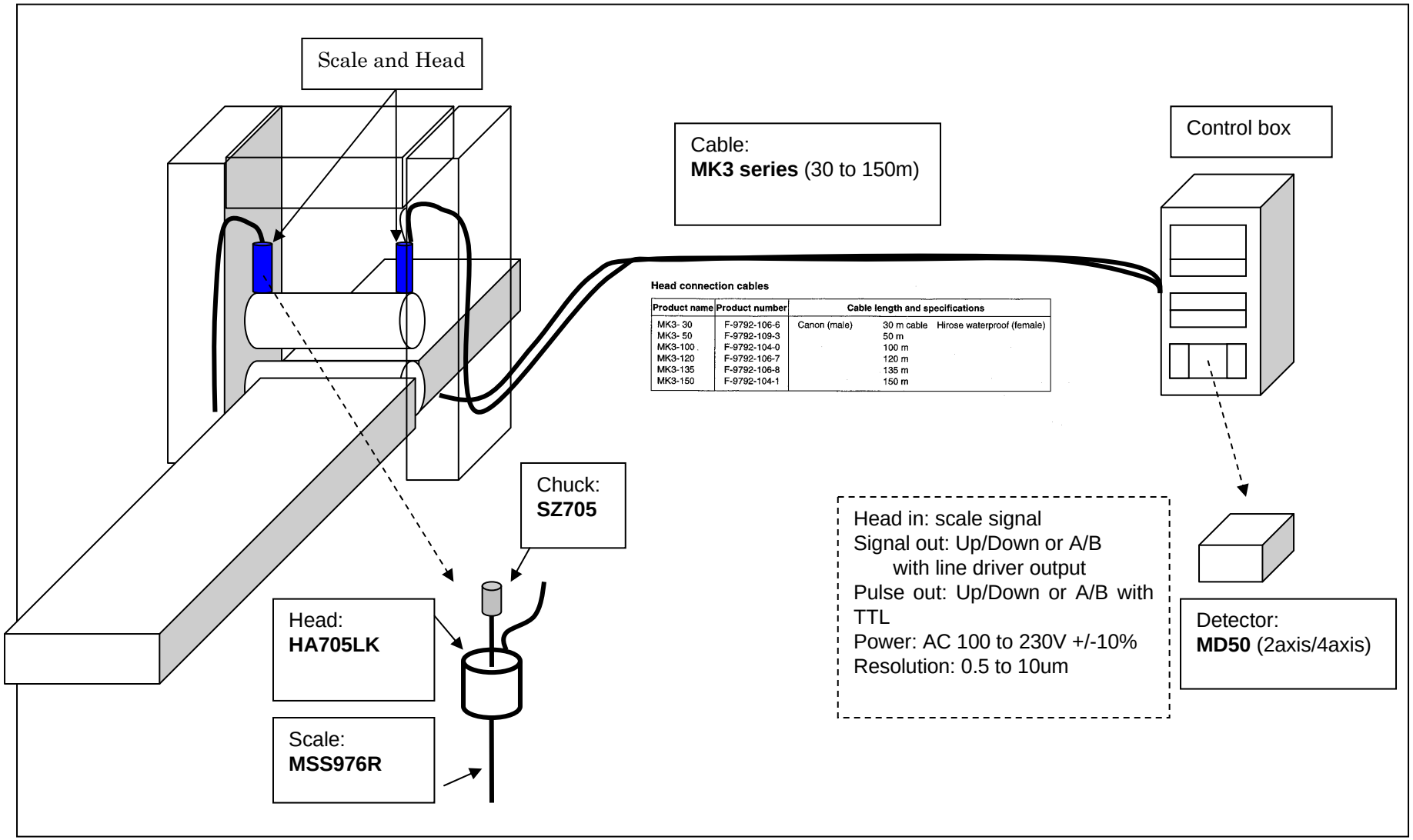
# Measuring system configuration




**Head connection cables**

| Product name | Product number | Cable length and specifications | | |
|---|---|---|---|---|
| MK3- 30 | F-9792-106-6 | Canon (male) | 30 m cable | Hirose waterproof (female) |
| MK3- 50 | F-9792-109-3 | | 50 m | |
| MK3-100 | F-9792-104-0 | | 100 m | |
| MK3-120 | F-9792-106-7 | | 120 m | |
| MK3-135 | F-9792-106-8 | | 135 m | |
| MK3-150 | F-9792-104-1 | | 150 m | |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# Configuration

| | |
|---|---|
| Coaxial linear scale | : MSS 976R |
| Chuck for fixing scale in place | : SZ705 |
| Waterproof MS head | : HA705-LK |
| Connection cable (30 to 150m) | : MK3 cable |
| Detector | : MD50 |


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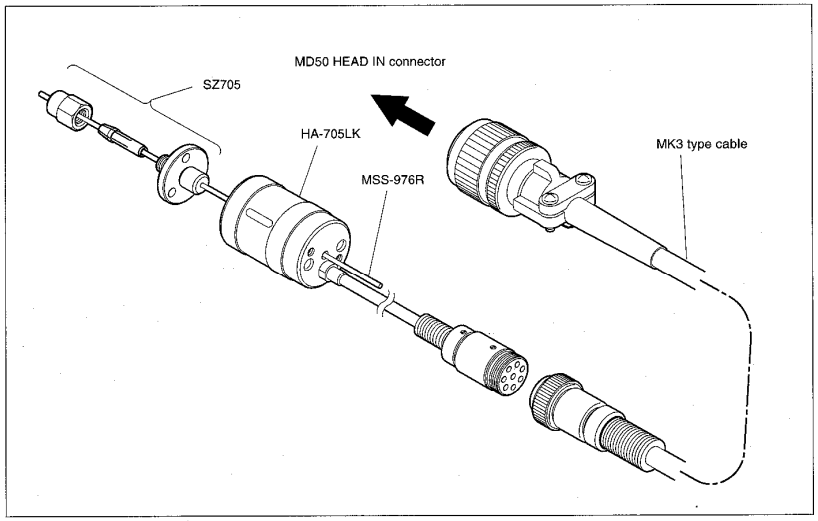
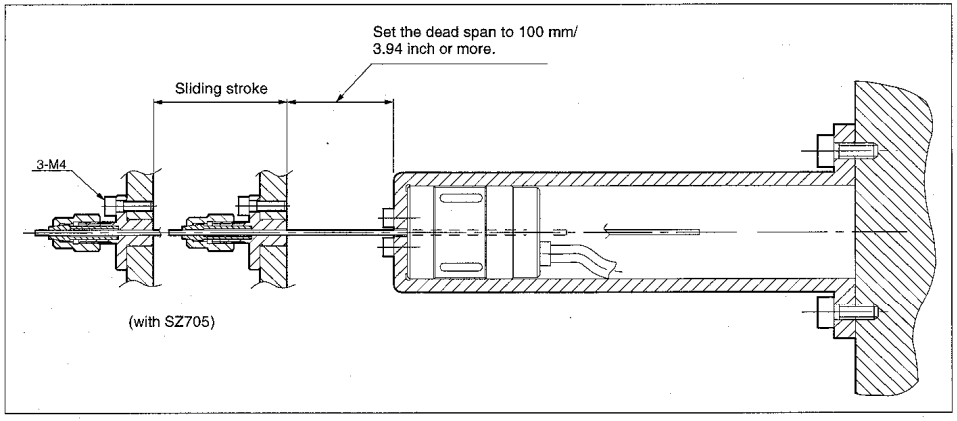
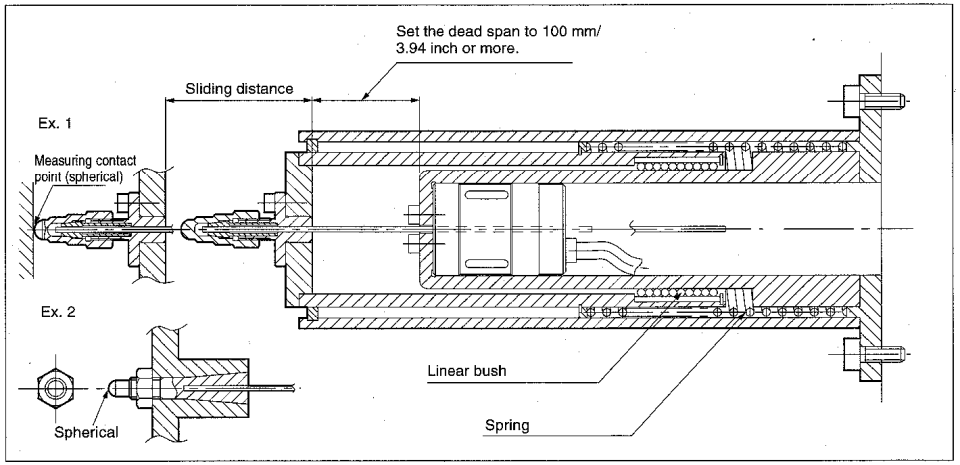
# Scale, Head and cable




**Example using machine's guide**




**Example with guide attached**





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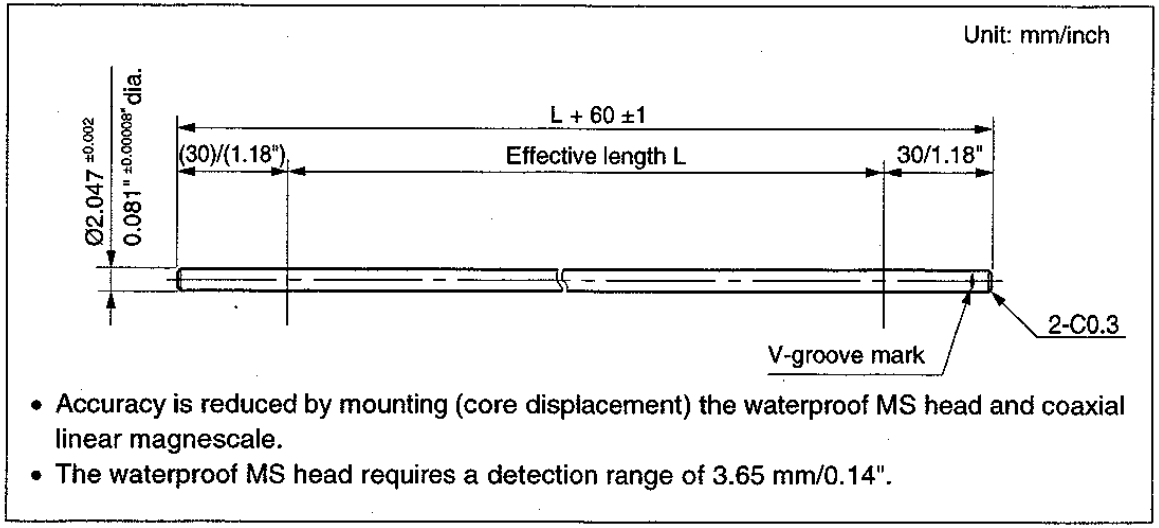
# MSS-976R (Scale)

| | |
|---|---|
| **Recording wavelength** | : 0.2 mm |
| **Material tension during recording** | : Cantilever indication (0N) |
| **Accuracy** | : 20 ± 0.2 °C |
| **Cumulative accuracy** | : 3 + 3/1000L (µm, p-p) |
| Cumulative accuracy in single direction, including the interpolation accuracy | |
| **Interpolation accuracy** | : 3 µm |
| PM ripple conversion | : 4.1% or less |

**External dimensions**

The V-groove mark serves as the zero point starting side for the accuracy measurement and corresponds to the attached data.




- Accuracy is reduced by mounting (core displacement) the waterproof MS head and coaxial linear magnescale.
- The waterproof MS head requires a detection range of 3.65 mm/0.14".



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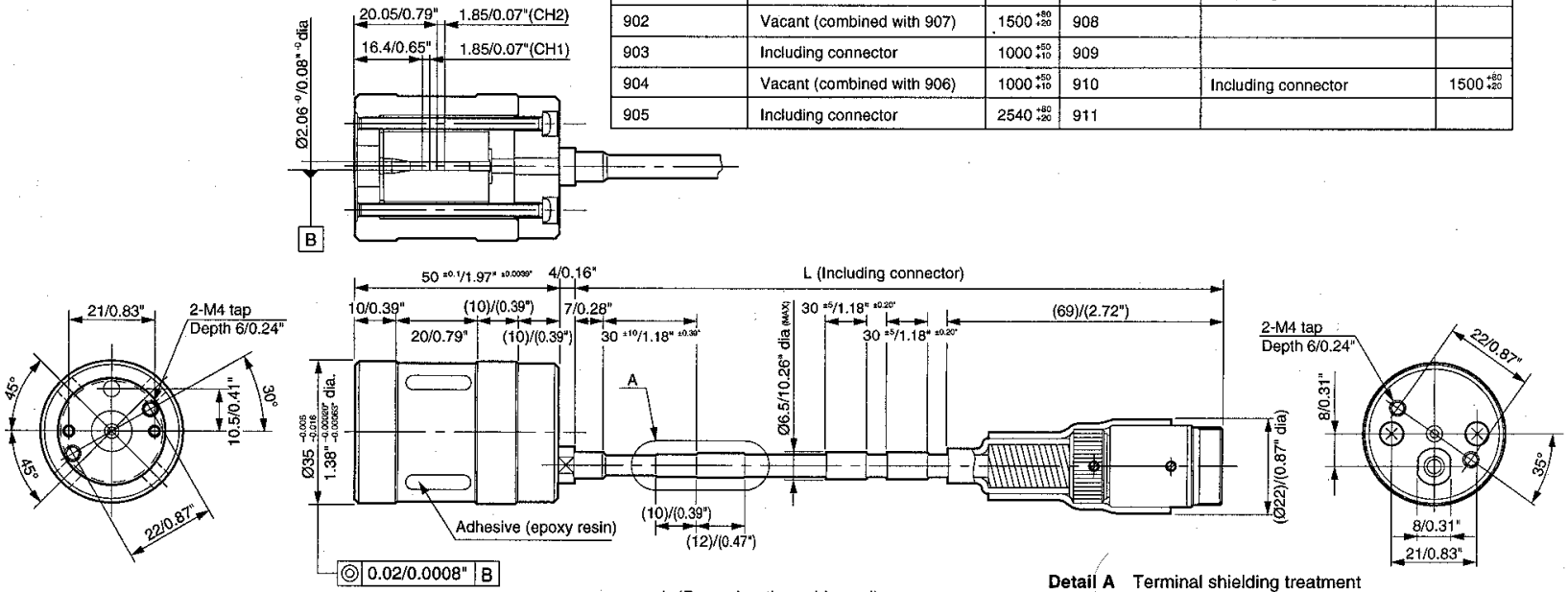
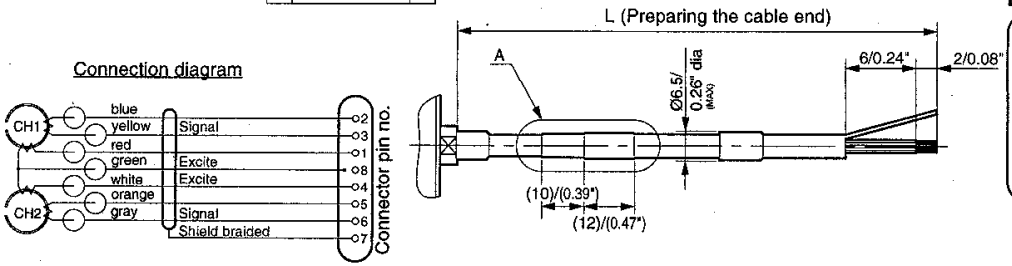
# HA705 (Head)

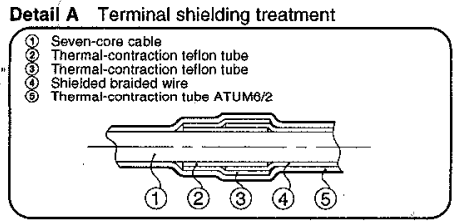
| Special connection model | Cable terminal processing, description | L measurement | Special connection model | Cable terminal processing, description | L measurement |
|---|---|---|---|---|---|
| Standard | Preparing the cable end | 500 $^{+50}_{+10}$ | 906 | Preparing the cable end | 1000 $^{+50}_{+10}$ |
| 901 | Including connector | 560 $^{+50}_{+10}$ | 907 | Preparing the cable end | 1500 $^{+80}_{+20}$ |
| 902 | Vacant (combined with 907) | 1500 $^{+80}_{+20}$ | 908 | | |
| 903 | Including connector | 1000 $^{+50}_{+10}$ | 909 | | |
| 904 | Vacant (combined with 906) | 1000 $^{+50}_{+10}$ | 910 | Including connector | 1500 $^{+80}_{+20}$ |
| 905 | Including connector | 2540 $^{+80}_{+20}$ | 911 | | |










**Insulation resistance and insulation yield strength**
There should be DC 250 V over at least 50 m and a one-minute leakage current of 5 mA or less at AC250 V between the coils, coil and head unit, head unit and housing, and shield and head unit.

**Note**
The connection section of the thermal-contraction tube ATUM6/2 for the cable does not have a designated location. (This is because the length varies depending on the contraction state.)

# MD50-2N/-4N (Detector)

## General

This MD50 series detector receives scale signals from our magnescale products, a device used primarily for rolling mills. This detector determines the movement direction of the scale and emits a pulse signal according to the movement amount. Since each axis is independent, each one must be set separately.

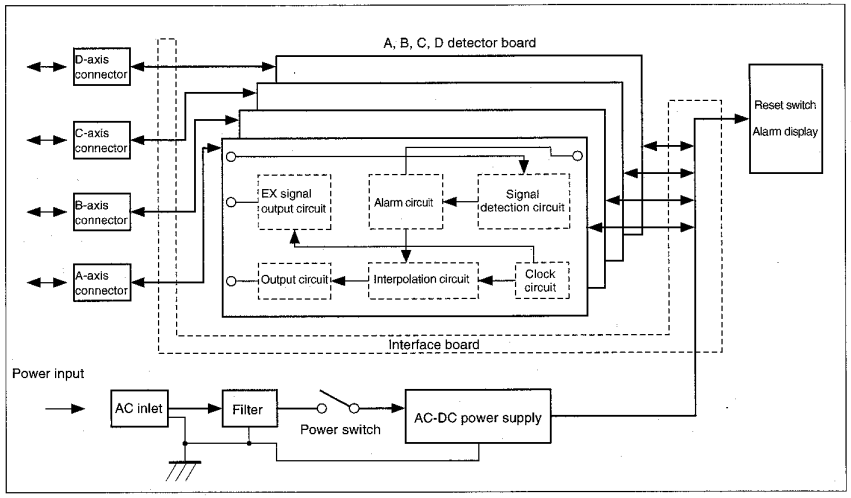
**Features**

- Maximum scale cable length : 150 m
- Maximum scale response speed : 100 m/min.
- Worldwide input voltage compatible with world power voltages
- Independent display function for alarm using digital system and analog system
- Minimum resolution : 0.5 µm

**Models**

MD50-2N : 2-axes input
MD50-4N : 4-axes input

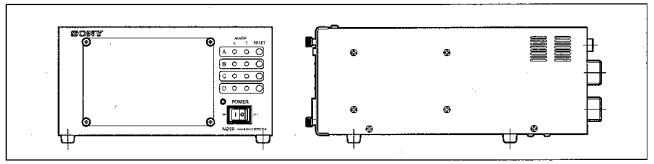
**Block Diagram of MD50 Configuration**




## Mounting

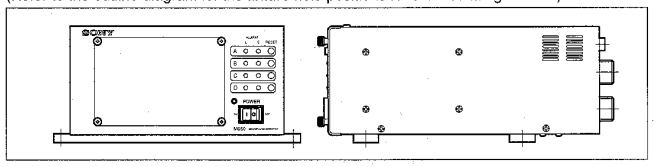
**Mounting only the MD50**

Place the MD50 on a flat surface with sufficient strength to support the device.



**Using insulating boards (accessory)**

Remove the rubber legs (four) screwed on the bottom of the unit with a Phillips head screwdriver.
Use two +M4×8 screws to secure each of the two insulating boards.
(Refer to the outline diagram for the fixture hole positions for the insulating boards.)



**Insulating board mounting procedure**



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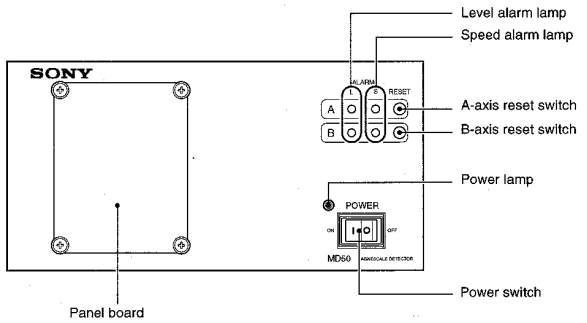
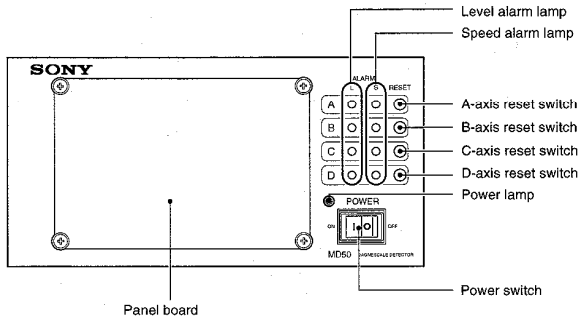
# Front and Rear View

**Front View**

**MD50-2N (2-axes input)**

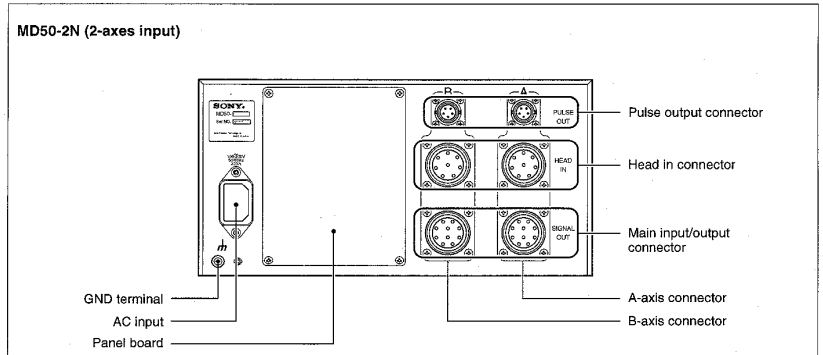



**MD50-4N (4-axes input)**

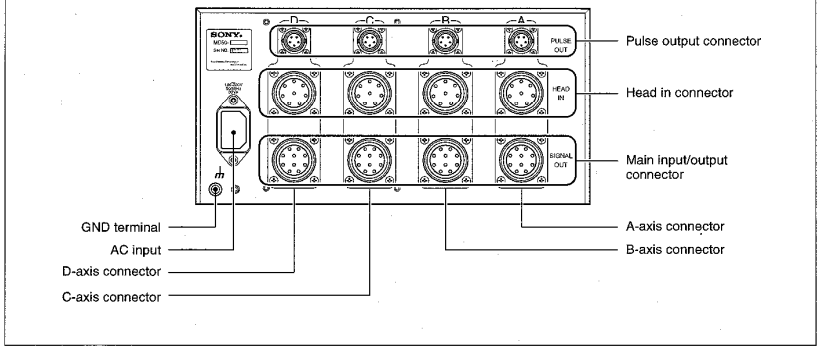



**Rear View**

**MD50-2N (2-axes input)**




**MD50-4N (4-axes input)**



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# Output pulse width and max. response speed

**Pulse width settings SW604**

| Multiple of standard value | 1/2 | Standard | 2 | 4 |
|---|---|---|---|---|
| SW604-1 | OFF | OFF | ON | ON |
| SW604-2 | OFF | ON | OFF | ON |

Perform the settings with a Phillips head screwdriver (small size).

**UP/DOWN output (settings JP602: UP, JP602: DOWN)**

How to read

| Pulse width : t (µs) | Maximum repeat frequency : Tw (MHz) |
|---|---|
| Maximum response speed (m/min.) | |

| | SW603-2 OFF (factory setting) | | | | SW603-2 ON | | | |
|---|---|---|---|---|---|---|---|---|
| | Output pulse width setting (multiple of STD.) | | | | Output pulse width setting (multiple of STD.) | | | |
| Resolution | 1/2 | STD. | 2 | 4 | 1/2 | STD. | 2 | 4 |
| 0.5 µm | 0.05 \ 10 / 100 | 0.1 \ 5 / 70 | 0.2 \ 2.5 / 35 | 0.4 \ 1.25 / 13 | 0.5 \ 10 / 100 | 0.1 \ 5 / 100 | 0.2 \ 2.5 / 65 | 0.4 \ 1.25 / 30 |
| 1 µm | 0.1 \ 5 / 100 | 0.2 \ 2.5 / 70 | 0.4 \ 1.25 / 40 | 0.8 \ 0.625 / 13 | 0.1 \ 5 / 100 | 0.2 \ 2.5 / 100 | 0.4 \ 1.25 / 60 | 0.8 \ 0.625 / 25 |
| 2 µm | 0.2 \ 2.5 / 100 | 0.4 \ 1.25 / 65 | 0.8 \ 0.625 / 30 | 1.6 \ 0.312 / 13 | 0.2 \ 2.5 / 100 | 0.4 \ 1.25 / 100 | 0.8 \ 0.625 / 50 | 1.6 \ 0.312 / 20 |
| 5 µm | 0.5 \ 1 / 100 | 1.0 \ 0.5 / 45 | 2.0 \ 0.25 / 13 | ——— | 0.5 \ 1 / 100 | 1.0 \ 0.5 / 55 | 2.0 \ 0.25 / 30 | ——— |
| 10 µm | 1.0 \ 0.5 / 45 | ——— | ——— | ——— | 1.0 \ 0.5 / 100 | 2.0 \ 0.25 / 55 | ——— | ——— |

**A/B phase output (settings JP602:A, JP602:B)**

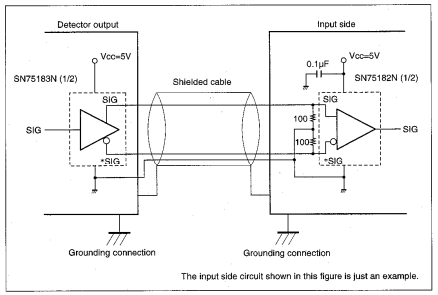
How to read

| Maximum repeat frequency : f (kHz) | Minimum phase difference : Tw (µs) |
|---|---|
| Maximum response speed (m/min.) | |

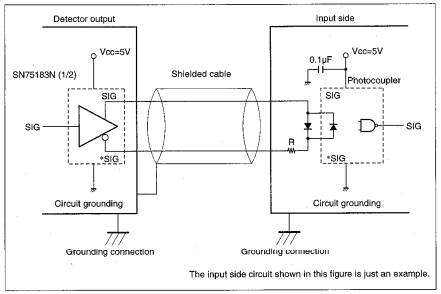
| | SW603-2 OFF | | | | SW603-2 ON | | | |
|---|---|---|---|---|---|---|---|---|
| | Output pulse width setting (multiple of STD.) | | | | Output pulse width setting (multiple of STD.) | | | |
| Resolution | 1/2 | STD. | 2 | 4 | 1/2 | STD. | 2 | 4 |
| 0.5 µm | 2500 \ 0.1 / 100 | 1250 \ 0.2 / 70 | 625 \ 0.4 / 35 | 312 \ 0.8 / 13 | 2500 \ 0.1 / 100 | 1250 \ 0.2 / 100 | 625 \ 0.4 / 65 | 312 \ 0.8 / 30 |
| 1 µm | 1250 \ 0.2 / 100 | 625 \ 0.4 / 70 | 312 \ 0.8 / 40 | 156 \ 1.6 / 13 | 1250 \ 0.2 / 100 | 625 \ 0.4 / 100 | 312 \ 0.8 / 60 | 156 \ 1.6 / 25 |
| 2 µm | 625 \ 0.4 / 100 | 312 \ 0.8 / 65 | 156 \ 1.6 / 30 | 78.1 \ 3.2 / 13 | 625 \ 0.4 / 100 | 312 \ 0.8 / 100 | 156 \ 1.6 / 50 | 78.1 \ 3.2 / 20 |
| 5 µm | 250 \ 1 / 100 | 125 \ 2 / 45 | 62.5 \ 4 / 13 | ——— | 250 \ 1 / 100 | 125 \ 2 / 55 | 62.5 \ 4 / 30 | ——— |
| 10 µm | 125 \ 2 / 45 | ——— | ——— | ——— | 125 \ 2 / 100 | 62.5 \ 4 / 55 | ——— | ——— |

1-

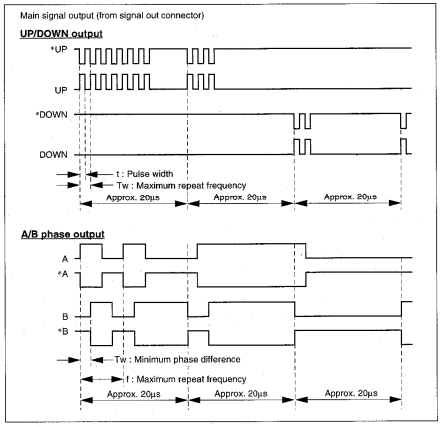
**Receiving signals with the line receiver**




**Receiving signals with a photocoupler**




**Output waveform (as seen from the MD50 output connector)**



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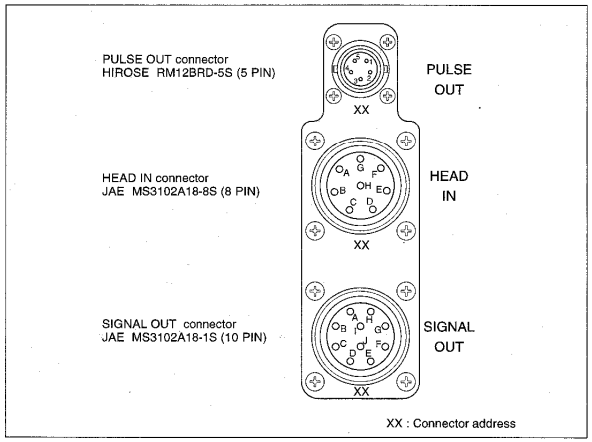
# Output connectors

| Connector | HEAD IN | SIGNAL OUT | PULSE OUT |
|---|---|---|---|
| Description | Input for head signal | Input and output for main | Output for auxiliary |
| Connector address | A2, B2 (2 axes)<br>A2, B2, C2, D2 (4 axes) | A3, B3 (2 axes)<br>A3, B3, C3, D3 (4 axes) | A1, B1 (2 axes)<br>A1, B1, C1, D1 (4 axes) |
| Signal name and Pin number | PIN# / Signal<br>A / EX+<br>B / ———<br>C / EX –<br>D / CH1+<br>E / CH1 –<br>F / CH2+<br>G / CH2 –<br>H / F-GND | PIN# / Signal<br>A / *UP or *A<br>B / UP or A<br>C / *DOWN or *B<br>D / DOWN or B<br>E / ALM+<br>F / ALMCOM_A<br>G / INAL+<br>H / GND<br>I / *SY<br>J / SY<br>* : Negative | PIN# / Signal<br>1 / *CU or *CA<br>2 / *CD or *CB<br>3 / GND<br>4 / ALM_H+<br>5 / ALMCOM_B<br>* : Negative |
| Name of connector to MD50 | JAE<br>MS3102A18-8S (8 PIN) | JAE<br>MS3102A18-1S (10 PIN) | HIROSE<br>RM12BRB-5S (5 PIN) |
| Name of connector to other party | JAE<br>MS3106B18-8P (8 PIN) | JAE<br>MS3106B18-1PX (10 PIN) | HIROSE<br>RM12BRG-5P (5 PIN) |

**Connectors used in the MD50:**




# Specifications -1

**Resolution and counting direction** The resolution and counting direction can be selected using the rotary switches on the board.

| Switch No. | Direction | Resolution | Switch No. | Direction | Resolution |
|---|---|---|---|---|---|
| 0 | + | 0.5 µm | 8 | – | 0.5 µm |
| 1 | ↑ | 1 µm | 9 | ↑ | 1 µm |
| 2 | \| | 2 µm | A | \| | 2 µm |
| 3 | \| | 5 µm | B | \| | 5 µm |
| 4 | ↓ | 10 µm | C | ↓ | 10 µm |
| 5 | — | — | D | — | — |
| 6 | — | — | E | — | — |
| 7 | — | — | F | — | — |

**Note**

The output pulse width and maximum response speed may vary depending on the resolution.

**Scales to be connected** Linear scale, rotary scale

**Quantization error** ±1 count

**Maximum response speed** 100 m/min

**Input axes** MD50-2N: 2-axes input
MD50-4N: 4-axes input

**Head connecting cable length** Maximum 150 m
However, the following conditions apply.
**Cable** : Sony Precision Technology-specified MK3 type
**Head** : Low-impedance head (HA-705K, HA-705LK)
(When using other than Low-impedance head : Maximum 50 m)

**Reset operation** The alarm display is reset and the output signal stop status is cancelled.

① Push the reset switch on the front panel.
② Reset using the external reset signal.
Supply DC +5V±10% between INAL+ and ALMCOM_A.
(Optoisolator PC817 input, 10 mA)

**Note**

Each axis has independent operation.



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# Specifications -2

**Power on alarm function**

When the power is turned on or the supply power is in failure, both alarm displays (level and speed) light up also the alarm signal (ALM+) comes out.
This function can be selected by the jumper pin (JP603) on the detector board.

| JP603 | Power on alarm function |
|---|---|
| R1 side | Valid |
| R2 side | Invalid |

**Alarm display and level alarm selection**

① **Level alarm display**
The setting level for level alarm display can be switched to the high or low level with the level alarm selector switch on the detector board.

The alarm is activated when the PM signal drops below the comparator level.

Comparator level
H (High) : 36% ± 5% of the PM signal approx. 1.4 Vp-p
L (Low) : 15% ± 5% of the PM signal approx. 0.6 Vp-p

② **Speed alarm display**
This alarm is activated when the interpolation circuit on the detector board overflows (the maximum response speed is exceeded).

**Note**

- The PM signal should be adjusted to 4 Vp-p at the check terminal.
- Both LED (Level and Speed) displays will light up when the power on alarm function is activated.

**Output signal**

① **Main output signal**
UP/DOWN or A/B phase signal
The signal can be selected by the board jumper pins. (Line driver SN75183 or equivalent product)
- The signal is set to UP/DOWN at shipment.
- Output pulse : Refer to 4-3-1.

② **Synchronous signal (Line driver SN75183 or equivalent product)**

**Standard settings**

| Resolution | Output pulse width ($t_{sy}$) |
|---|---|
| 0.5 µm | 0.15 µs |
| 1.0 µm | 0.3 µs |
| 2.0 µm | 0.6 µs |
| 5.0 µm | 1.5 µs |
| 10 µm | 3.0 µs |

**Optional settings**
Pulse width ($t_{sy}$) : 8 µs Period : 20 µs

③ **Alarm output signal (Optoisolator PC817 or equivalent product)**

1. Alarm signal (ALM+)
   This alarm signal can be selected from the combination of the level alarm and the speed alarm or the level alarm only.
   This signal is output when the head cable is disconnected.
   When the output signal from the head is reduced, and when the detector interpolation circuit overflows.
   - During factory shipment, the level alarm is set to Low.
   - The alarm signal comes out when the power on alarm function is activated.

2. Alarm signal (ALM_H+)
   The level alarm H signal is output. The H signal is output when the PM signal drops below 1.4 Vp-p or less.

④ **Auxiliary output signal (TTL SN74LS37 or equivalent product)**
UP/DOWN or A/B phase signal
This signal can be selected using the board jumper pins (same as the main output signal).

**Note**

This is set to UP/DOWN signal at factory shipment.

**Input power voltage** 100 to 230 V ±10%, 50/60 Hz

**Power consumption** Max. 70 VA

**Operating temperature** 0 to +40 °C (+32 to 104 °F)

**Starage temperature** –20 to +60 °C (–4 to 140 °F)

**Applicable standards**
UL3101-1
FCC Part 15, Subpart B, Class A
EMC Directive EN55011 Group 1, Class A
EN50082-2
Low Voltage Directive EN61010-1

**Compatibility**
Sony Precision Technology products common I/O connectors with MSD560N series (same signal and pin assignment).
① HEAD IN
② SIGNAL OUT
③ PULSE OUT

**Installation methods**
① Placing on a flat surface
② Securing using insulating boards (accessory)
③ Mounting to a 19-inch size rack using panel mounting brackets (accessory)

**Weight**
Approx. 5.8 kg (12.4 Lbs) 2-axis input
Approx. 7.0 kg (15.5 Lbs) 4-axis input

**External dimensions**
260 (W) × 359.5 (D) × 141.5 (H) mm / 10.236"×14.154"×5.571"
Refer to separate outline drawing for the dimensions when using the insulating boards and panel mounting boards.


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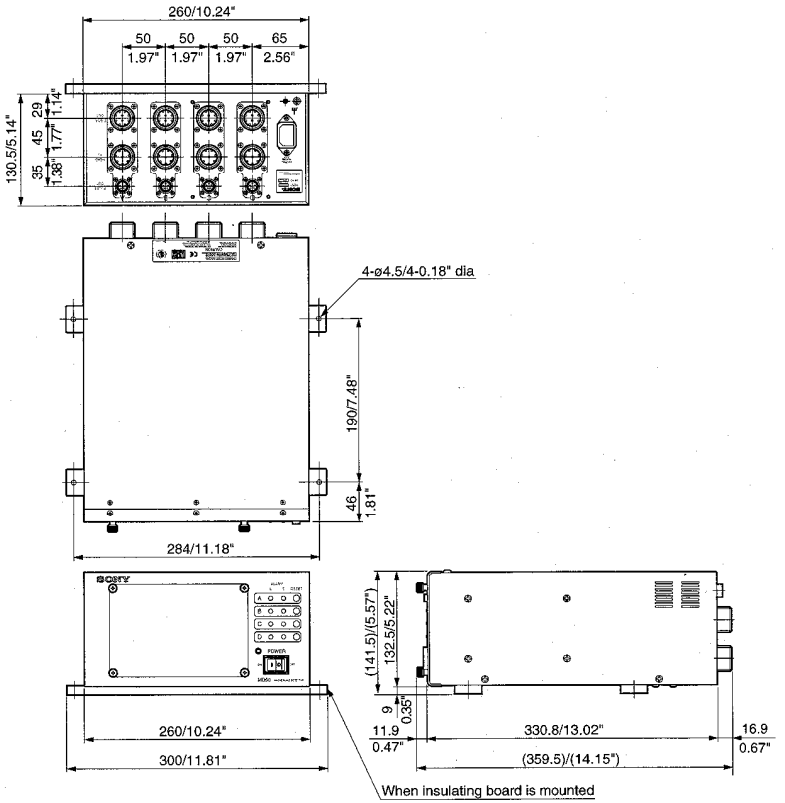
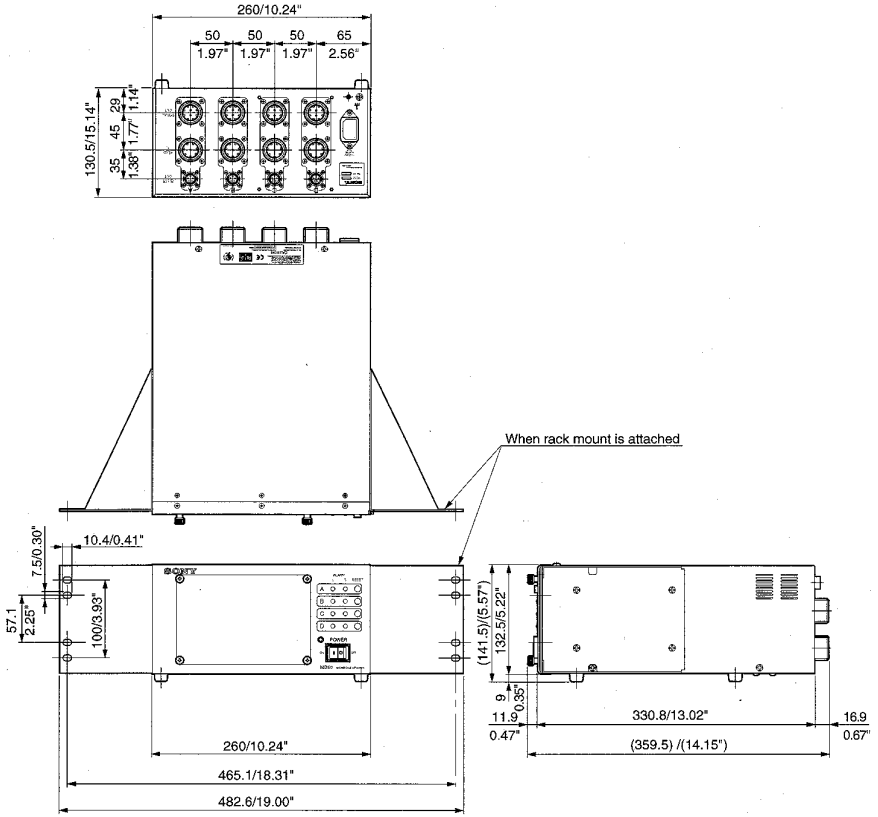
# Dimensions

### MD50 (when insulating board mounted)

**Note**
The 2-axis model omits the C-axis and D-axis.




### MD50 (panel board mounted)





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