

A/D Converter For Ultra-Precision Position Detector MP-SCALE

MP-SCALE UNIT



Mitsubishi-Hitachi Metals Machinery, Inc

- Application -

This machine is the exclusive A/D converter of ultra-precision position detector MP-SCALE (Mitsubishi PRECISION SCALE). It is mainly used as a high precision position detection machine for pressurizing cylinder of an iron-manufacture machine rolling mill.

Note: About MP-SCALE:

MP-SCALE is an un-contacting ultra-precision position detection machine that detects the displacement in length and angle at high precision in un-contacting using electromagnetic coupling. (Name change from the conventional inductosyn.)

- Features -

1. High precision

It changes into a digital value of 1 micrometer of the minimum detection unit to employ the detection performance of MP-SCALE in the maximum efficiency.

2. High response

The control response of hydraulic cylinder is taken into consideration, and renewal of data is performed in 0.5ms of position detection cycle. Moreover, data can be easily read by using a reading permission signal (INH signal).

3. Compact structure

Compact structure containing the portion of two axes in the UNIT of 560w x 190h x 428d, and it is also possible to contain it in the same control panel of other apparatus.

4. Maintenance

In consideration of ease of maintenance, it has the following functions.

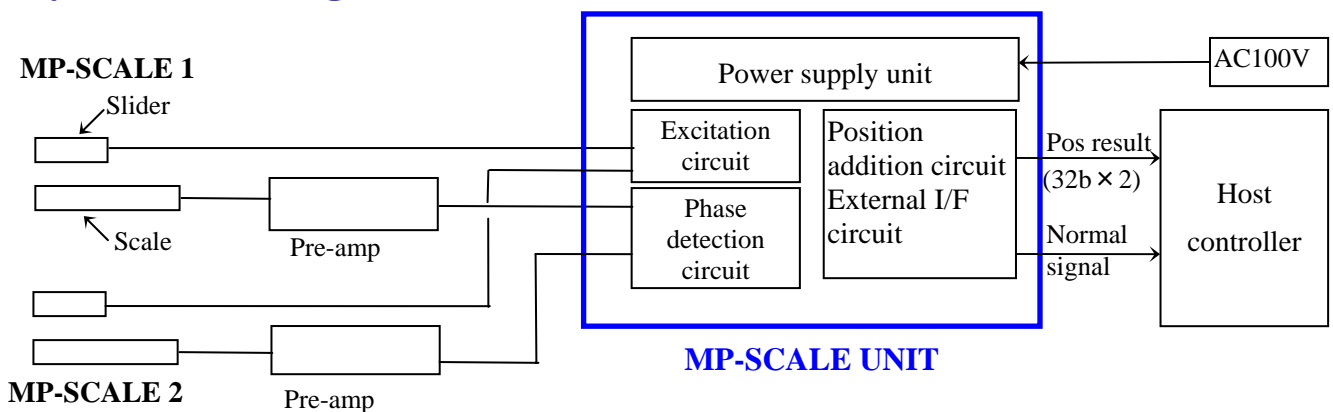
- (1) The numerical value of a position actual result and the contents of an alarm at the time of errors are displayed on the front of UNIT.
- (2) By connecting an imitation sensor (MP-MATE), check of the UNIT proper, I/F check with a host controller, etc. can be performed easily, without operating actual cylinder.
- (3) At the time of UNIT failure, since it requires exchange by UNIT, the exchange work is easy. Moreover, since most of the external apparatus connection parts serve as connector (excluding the power supply and signals in part), quick restoration is possible.

5. Error detection

Error detection of the following within the UNIT is carried out. When an error occurs, while displaying it on the front of UNIT, a detector error signal is outputted outside.

- (1) Sensor disconnection error (the FBK signal Level is supervised)
- (2) Position detection value change rate error (the difference between the previous value and the present value of detection, which is digital, is supervised.)

- System Configuration -



- External I/F Specification -

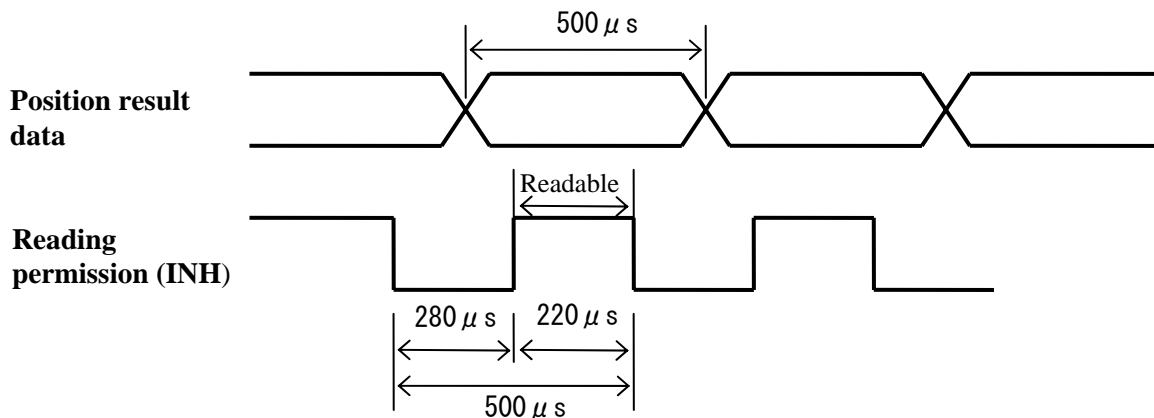
Output signal				
Signal	Number	I/F	Specification	Note
Position result DATA (Increment min 1 μ m)	32 \times 2ch (Binary positive value)	Open-collector output	MAX DC60V, 20 mA	Generally Common
Reading permission (INH)	2 (2ch independent)	Open-collector output	MAX DC60V, 20 mA	
UNIT Status	14	Open-collector output	MAX DC60V, 20 mA	
UNIT normal signal	1	Open-collector output	MAX DC60 V, 20 mA	Independently Common

Input signal				
Signal	Number	I/F	Specification	Note
Sensor reset signal	3	Photo-coupler input	DC24 V, 17.3 mA	Ch indep.: 2 2ch comm.: 1 500 ms or higher: ON
			DC48 V, 16.0 mA *	

* DC48V is a special edition. DC24V specification is recommended.

Data output timing

The output timing chart of the position actual result data and the reading permission signal is as follows.

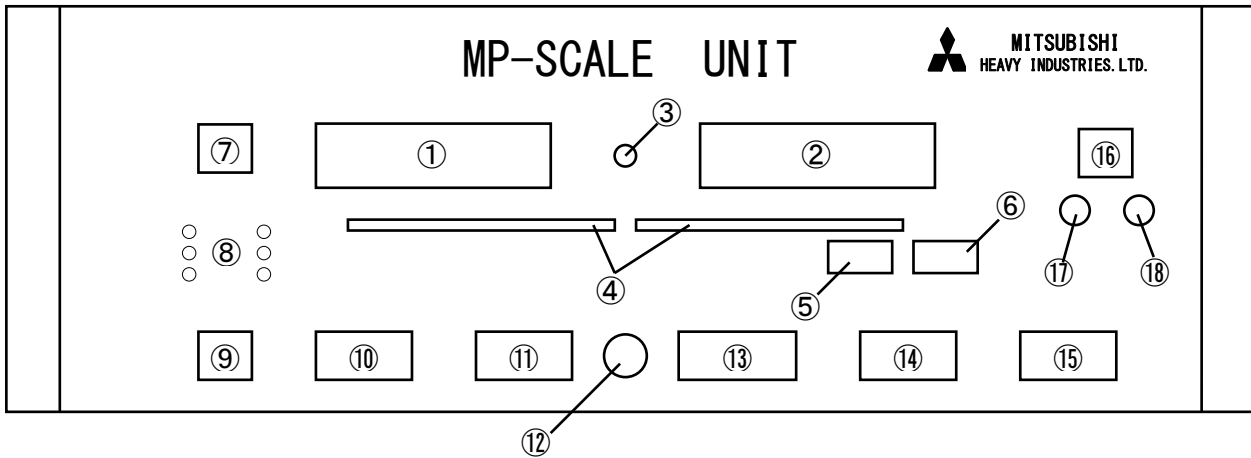


- External Power Supply -

Application	Supply voltage	Consumption current
Main power supply	AC 100 V	1.18 A
Internal cooling fan power supply	AC 100 V	0.82 A

- MP-SCALE UNIT Sketch Drawing -

Front view



Mark	Name	Mark	Name
①	Cylinder pos. display CH1 (8 digits/ μ m)	⑩	Feedback input CH1 connector
②	Cylinder pos. display CH2 (8 digits/ μ m)	⑪	Feedback input CH2 connector
③	Error LED	⑫	Clock I/O connector
④	Digital output test LED (32 bit)	⑬	Test unit connector
⑤	Digital input test DIP-SW (8 bit)	⑭	Excitation output CH1 connector
⑥	Parameter setting DIP-SW (8 bit)	⑮	Excitation output CH2 connector
⑦	Cylinder pos. reset SW	⑯	Cylinder pos. offset SW
⑧	Disconnection error LED	⑰	Cylinder displacement output CH1 (± 10 V)
⑨	Test mode SW	⑱	Cylinder displacement output CH2 (± 10 V)



- Comparison with Old Type Inductosyn Panel -

The comparison table of MP-SCALE UNIT and an old model inductosyn panel is shown below.

	Item		Inductosyn panel	MP-SCALE UNIT
Sensor area	Sensor		Scale & Slider	Same as left
	Amplifier		Pre-amplifier	Same as left
	Sensor electric specs/ Signal processing		Applying the short waveform of 2 kHz excitation (SIN and COS), perform phase comparison with the standard waveform after fixing the waveform of induced voltage by filtering.	Same as left
A/D converter area	Structure		Exclusive control panel (max. 6ch/panel)	UNIT structure (max. 2ch/UNIT) (In case of assembling to the panel of the same size as the left one, max. 8 ch / panel)
	External I/F	Pos. actual result + INH	Open-collector max DC150V, 50mA DATA max 19b/ch 1 μ m Increment DATA updating cycle: 0.5ms	Open-collector max. DC 60V, 20mA DATA max 32b/ch 1 μ m Increment DATA updating cycle: 0.5ms
		Normal signal	Mercury relay point of contact max. 500V, 2A	O/C max. DC60V, 20mA
		Pos. reset signal	Relay input, DC48V	Photo-coupler input DC24V, DC48V selected
	Position actual result display		Indicator installed to the control panel front door	Indicator mounted to the UNIT front
	Power supply unit		Common to the inside of control panel	Built in the unit

Since the sensor and the amplifier are completely the same ones used as shown in above table, and the I/F specification with the host computer side is also manufactured in consideration of compatibility with the inductosyn panel, when replacing the inductosyn panel with MP-SCALE UNIT, it can be carried out without the reconstruction of the sensor and the host computer sides. The concrete method (proposal) of replacing is shown below.

- (1) When the case of the existing inductosyn panel is used
 - ① Withdrawal of the apparatus in the panel
 - ② Inclusion of MP-SCALE UNIT (the partial processing necessary for an attachment bar)
 - ③ Wiring in the panel (new: the cable between MP-SCALE UNIT and external TB)
- (2) When a MP-SCALE panel is installed newly
 - ① External wiring removal
 - ② Inductosyn panel withdrawal
 - ③ MP-SCALE panel installation
 - ④ External wiring restoration