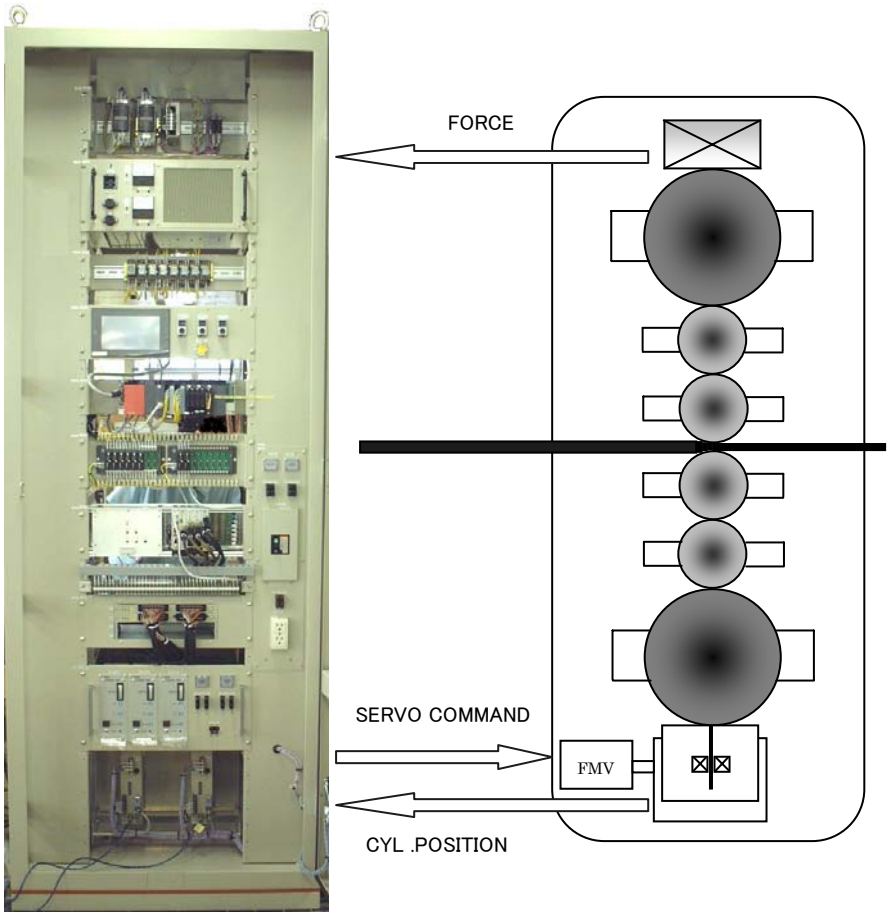
HYROP CONTROL PANEL
MH－PC４



三菱日立製鉄機械株式会社
Mitsubishi-Hitachi Metals Machinery, Inc.

HYROP CONTROL PANEL (MH-PC4)

2009.06

Outline of HYROP

HYROP control panel(MH-PC4) is structured using micro processors(CPU). Closed loop operation process which require high-speed operation is constructed by exclusive use C_LOOP board. Interface and compensation process which require high-accuracy and multifunctional operation is constructed by MAIN CPU board. So, it can realize high accuracy, multi-function use, and high response and performance.

What is HYROP ?

HYROP means "Hydraulic Roll Positioning Device" and use strong Force Motor Valve (FMV) for roll gap control of rolling mill.

＊:MOOG servo valve etc. is also applicable.

- High speed response HYROP → AGC accuracy will be grade up
- Change of servo mechanism

HYROP－M (mechanical servo)

⇩

HYROP－F (use FMV : electro-hydraulic servo)

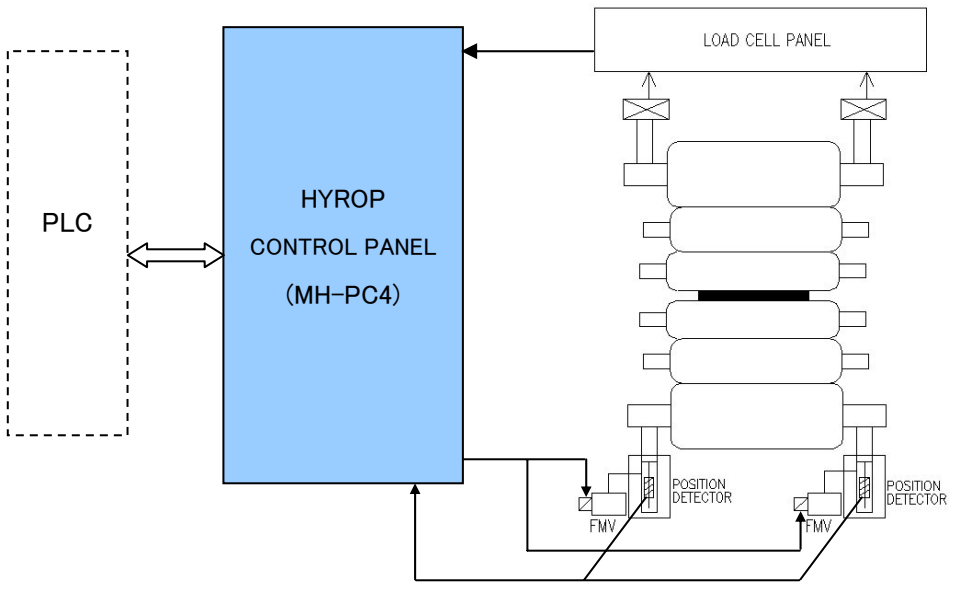
Structure of HYROP - F

Using FMV 、and connect to hydraulic, cylinder directly.

Strong direct drive type servo valve → High response、Capable for anti-contamination、No need spool feedback control.

- High resolution (1 μm) CYL position detector.: Absocorder、Magnescale
- Multi-microcomputer structure

High accuracy, High response, Multi-function DIGITAL SERVO CONTROL



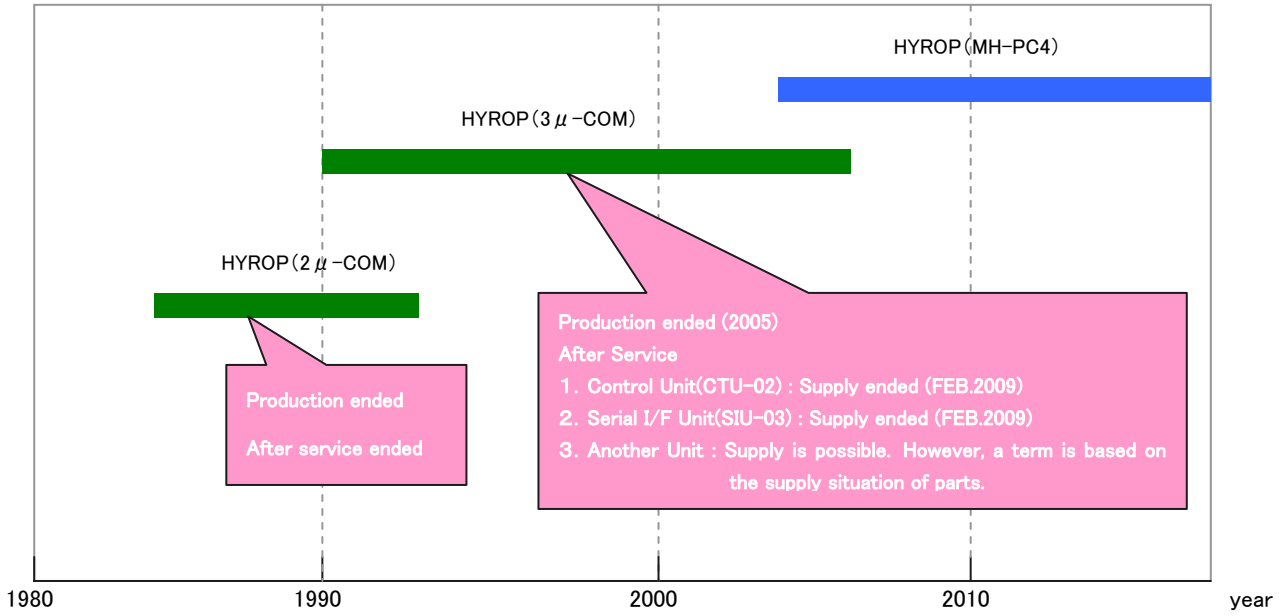
Features of HYROP control panel
(MH－PC４)

We developed the third generation HYROP control panel using the latest CPUs

Our own development	Steady service over a long period.
High speed digital processor	High speed response High accuracy position control. Controlling two stands by one HYROP panel. Compact panel structure for Tandem mill etc.
Control unit	Board system is used.
Contain all of standard library routines.	HYROP is tuned to your particular needs. (i.e. any type of cold mill, hot mill and skin pass etc.)
High level monitoring function	On-line monitor : real time monitoring of internal control signals. Off-line monitor: data storage in memory continuously and stopped by trigger and can draw chart. Operation history allows identifying faulty place.
System test function included	Step response test, mill modulus measurement function included.
Touch panel	Displaying oil height, machine status, faulty record and guidance for trouble shooting.
Servo-watcher function enable (option)	Make high level servo loop analysis by means of getting FMV spool displacement.
Many application records.	Applied to TCM、RCM、SPM、ZRM、several types of HSM and modernization / replacement.

History of HYROP control panel

Model change of HYROP control panel



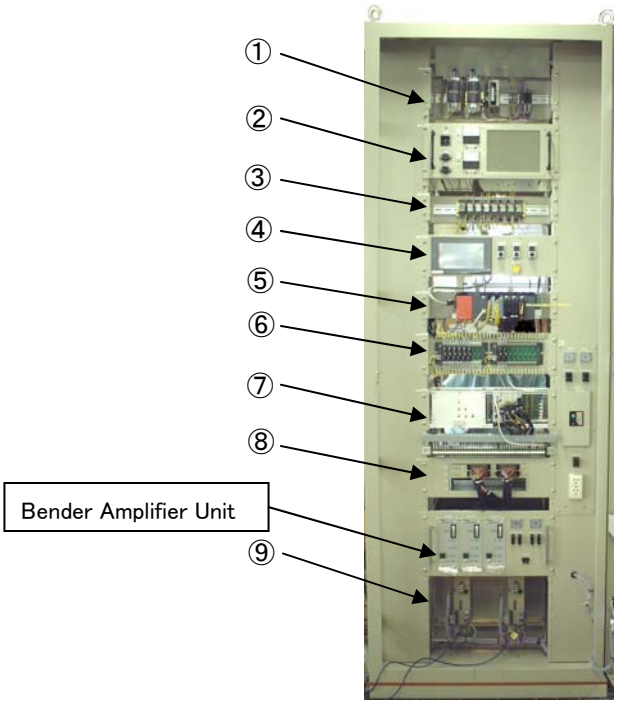
Performance of the latest version of HYROP (MH-PC4) compared with older versions

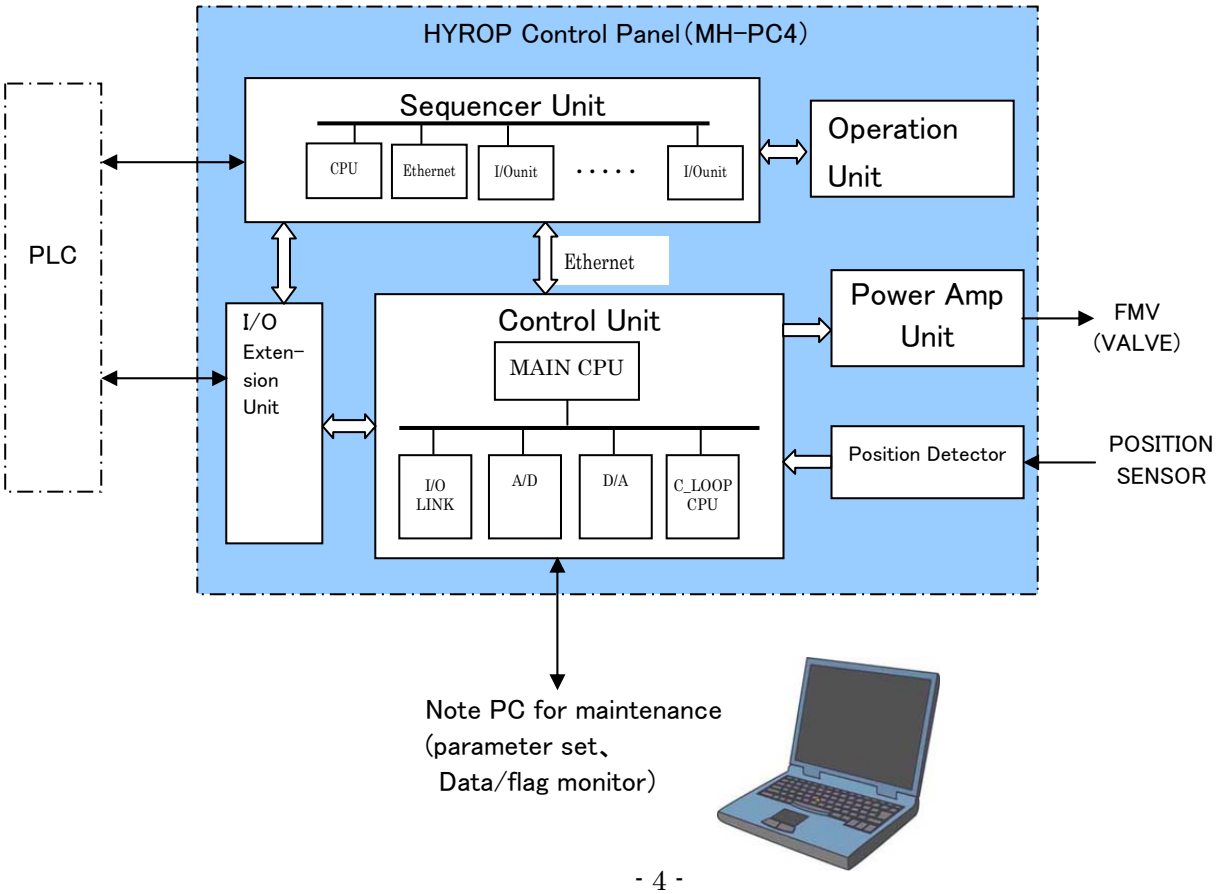
Items	HYROP (2μ-COM) (production ended)	HYROP (3μ-COM) (production ended)	HYROP (MH-PC4)
CPU	68000 8MHz	68000 12MHz	SH－4 167MHz
Memory	512KB	1MB	128MB
Touch panel	NO	NO	YES
Trace function	NO	NO	YES
Test function	NO	NO	YES
Control unit	Board type	One apparatus type	Board type
PANEL	1 std／1 PANEL	1 std／1 PANEL	1 std／1PANEL 5 std／3 PANEL(TCM)

Construction of HYROP control panel

Units

① Power Supply Unit
② Power Amplifier Unit
③ Relay Unit
④ Operation Unit
⑤ Sequencer Unit
⑥ Isolation Unit
⑦ Control Unit
⑧ I/O Extension Unit
⑨ Position Detector





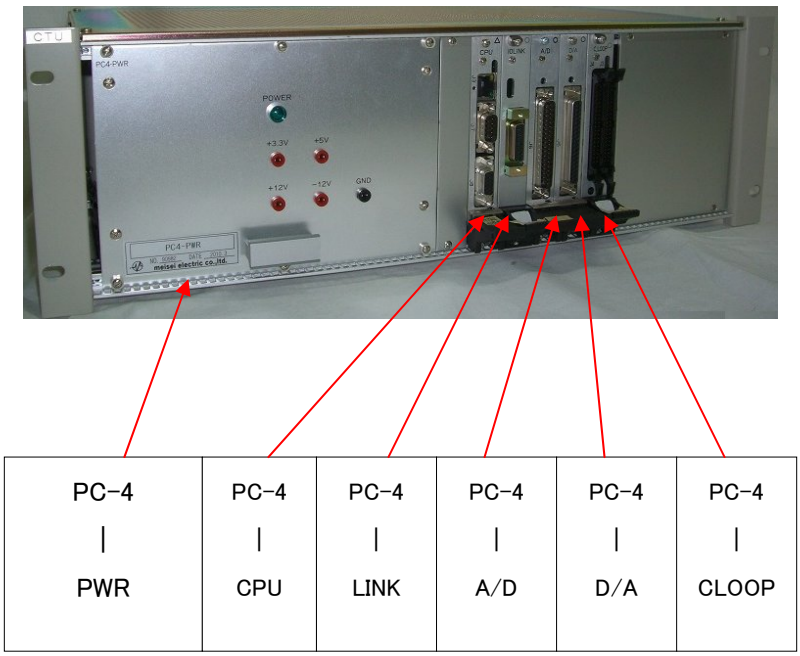
The merit of to choose HYROP(MH-PC4)

■ Maintenance cost reduction

The former HYROP panel needs to exchange whole control unit, when the unit trouble occurs.

In order that it becomes the structure of a board, control of MH-PC4 is exchanging boards, and restoration of it is attained immediately and it can aim at reduction of a maintenance cost.

(Control unit MH-PC4)



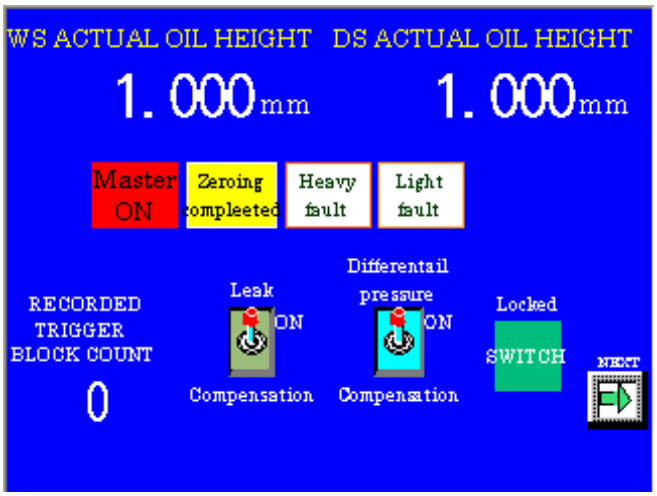
(Former control unit)

Specifications of HYROP control panel

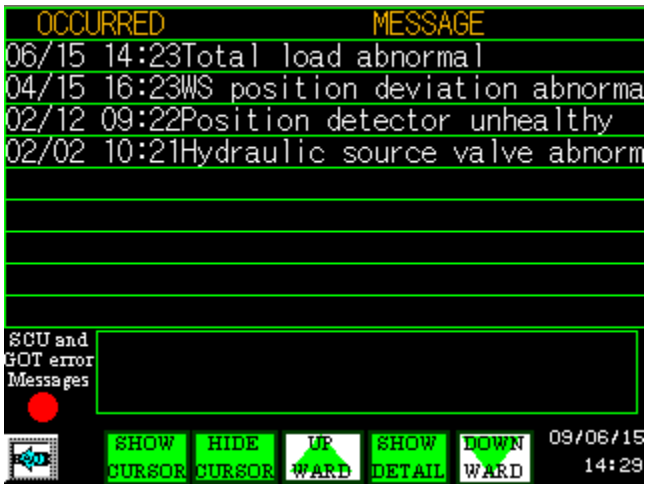
- Position Detector
  Magnescale or Absocorder
- Servo-Valve
  FMV(MOOG valve also available)
- Basic function
  Position control loop : position data take、deviation calculation、control signal output
  Compensation : deferential pressure、leak 、dither
- Manual handling
  Both side open/close : WS・DS same direction same number drive
  Levering : center levering type
- Automatic control (with line control PLC)
  AGC : Automatic gauge control
  APC : Automatic position control
  ALC : Automatic levering control
  MMC : Mill modulus control
  REC : Roll eccentricity control
  CPC : Constant pressure control
  Q.OPEN : Quick open control
- Display
  Oil height、fault list、trouble shooting etc.
- Panel
  Closed stand alone
- Power consumption
  AC100/110V、50/60Hz、1φ、2KVA
- Environment condition
  Temperature in operation : 0～+40 ℃
  Temperature in shut-off : －10～+60 ℃
  Humidity : 10～80 %RH (no water drop)
  Dust : Less than 1.0 mg/m^3
  Vibration : ±0.5 mm 1,000rpm
  Shock : 10G
- Size／weight
  - RCM (1 std／1PANEL)
    850(W)×926(D)×2,420(H) mm ／ 400kg
  - TCM (5 std／3PANEL)
    2,550(850×3)(W)×926(D)×2,420(H) mm ／ 1,200kg

Display of operation unit

■ Main display page

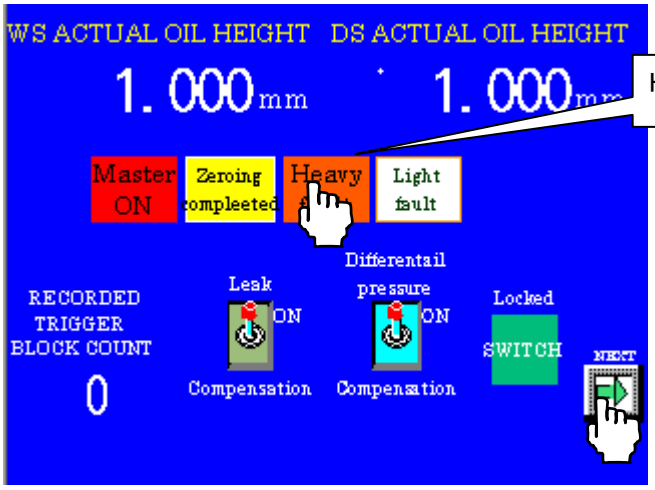


■ Fault display page

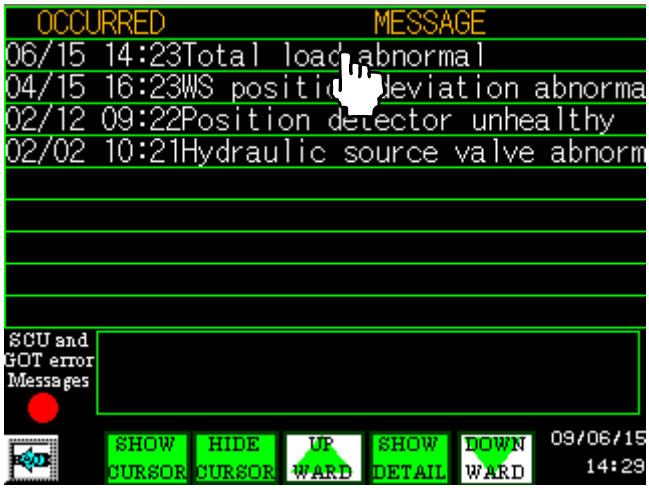


Trouble shooting

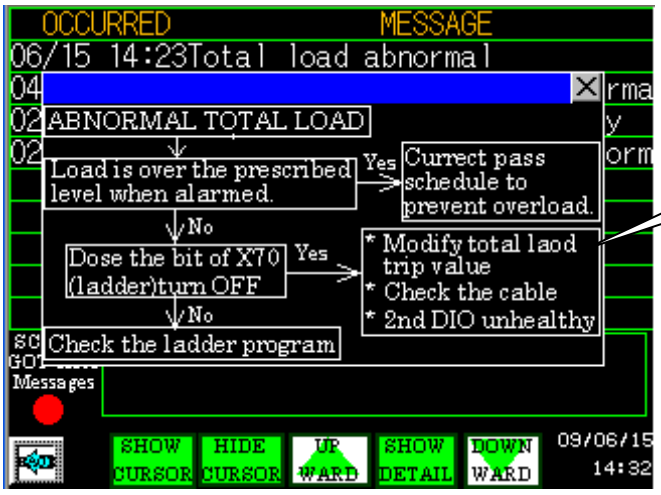
You can use on touch panel quickly



Show cause of fault



Trouble shooting guidance starts in one touch operation.

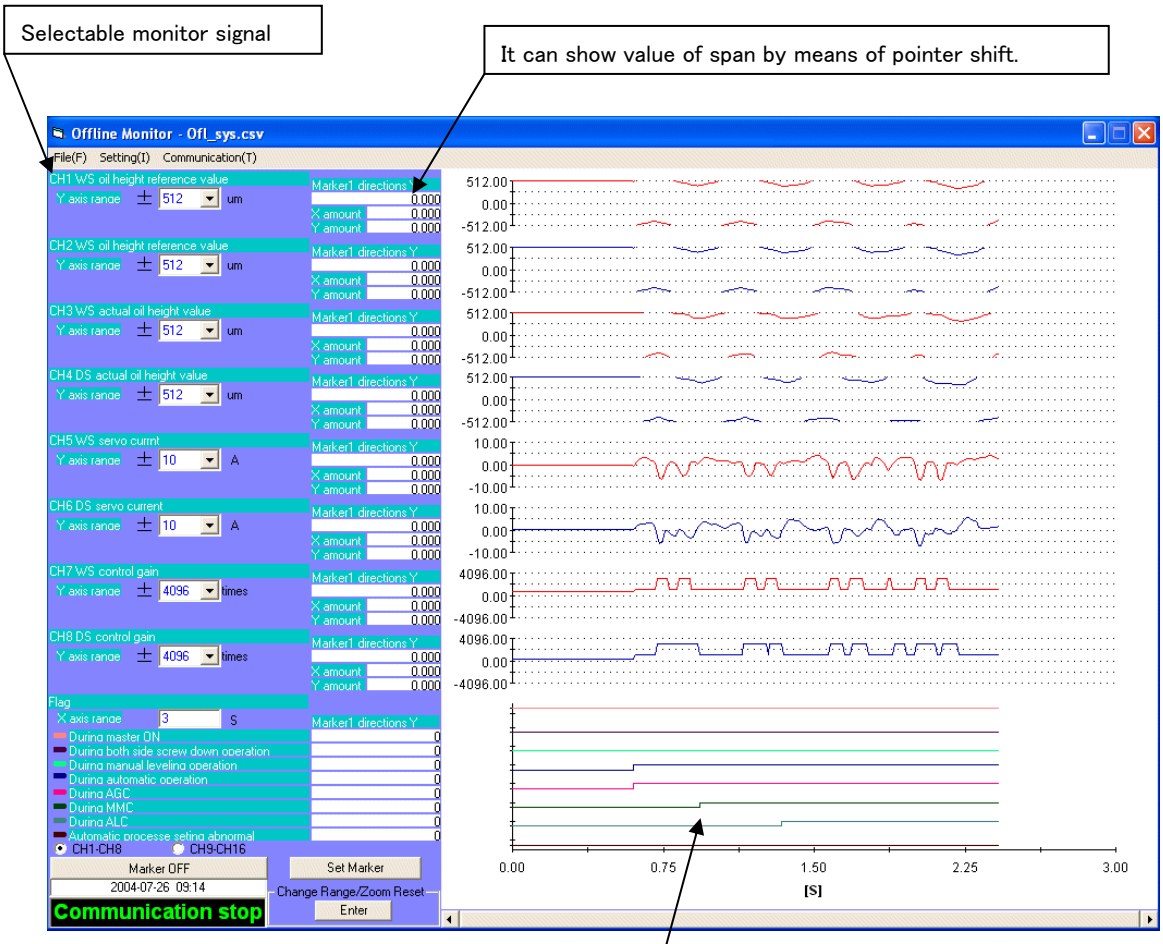


Step by step flowchart leads you the solution

An example of data trace function

It will help you to find cause of trouble.

It will display on the note PC several data chart which is collected in the memory of control unit.

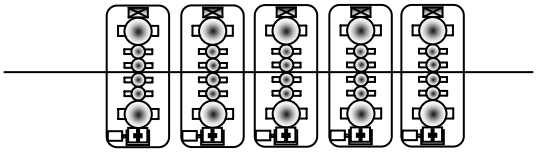


Applied Mill types ／ Supply records

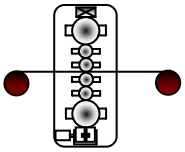
Many kinds of control have been realized.

Applied Mill types

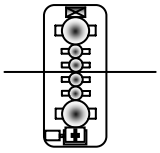
TCM



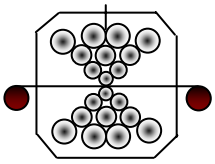
RCM



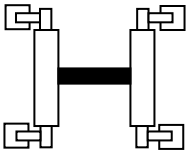
SPM



ZRM



HSM（Edger）

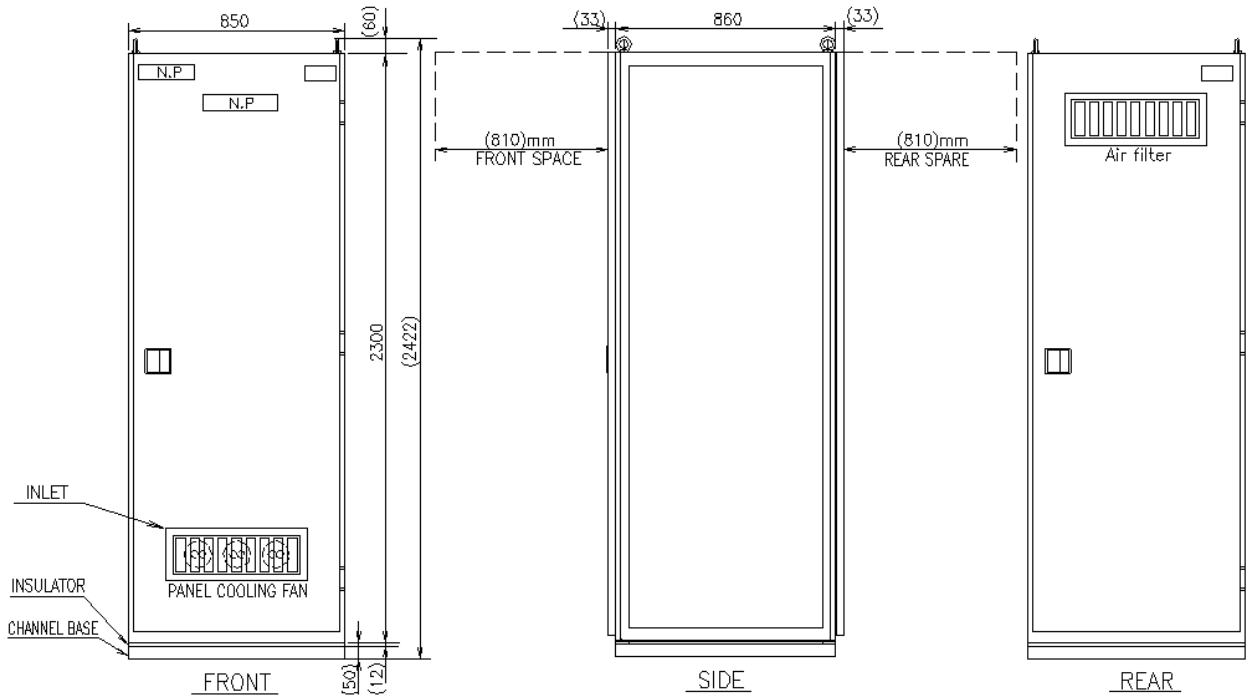


Supply records

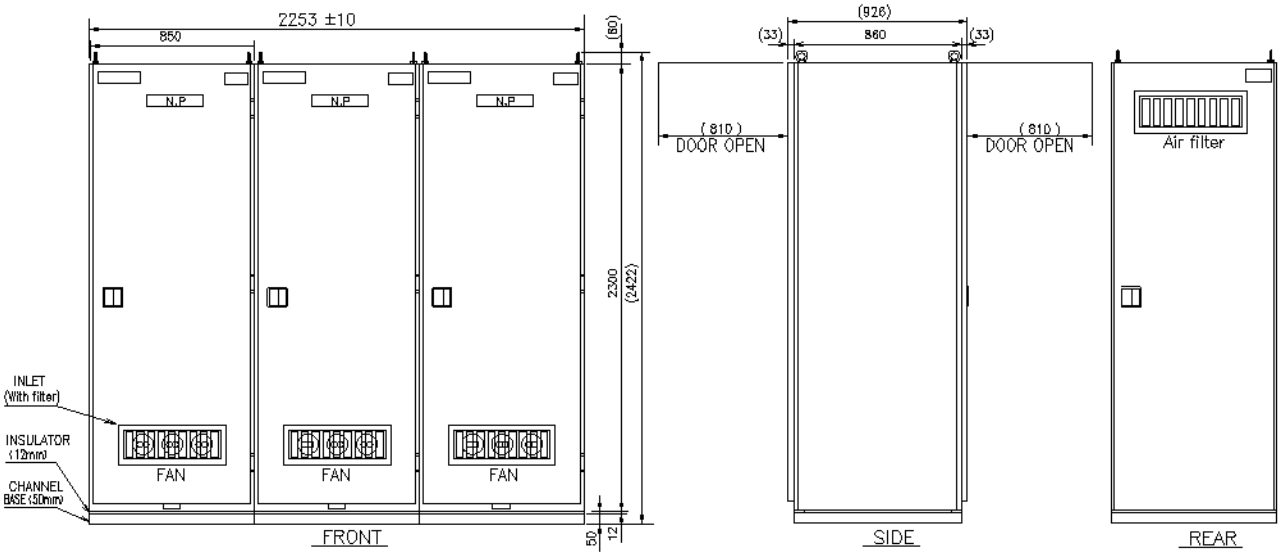
Japan、China、Korea、Taiwan、Thailand、Vietnam、India、USA、Europe（CE marking gotten）、Africa、over 300 panels have delivered.

Outline drawings of panel

1 std／1PANEL



5 std／3PANEL

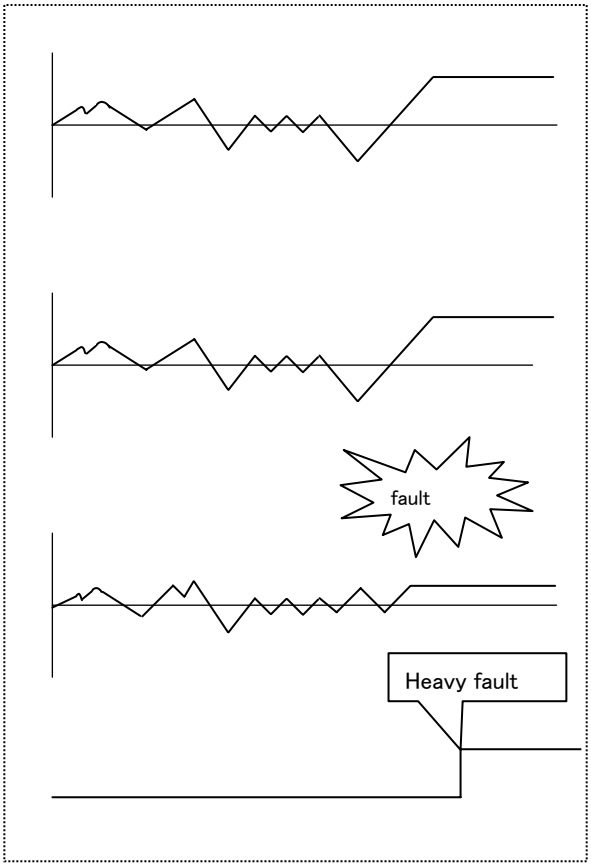


OPTION

Servo-Watcher

High level servo loop analysis will be supported by means of getting FMV spool displacement.
Easy finding of fault point and down time will be short.

- Finding spool sticking.
- Analysis of fault point is on control(electrical) or on hydraulic(mechanical).
- Finding cable miss connection.
- Finding push up cylinder bad motion.



Current pattern command/real value are not equal.
Not equal is caused by
- Amp damaged
- cable cutting or miss connection
- coil cut、short

Current pattern command//spool displacement.
Not equal is caused by
- spool stick
- FMV spring trouble.
- opposite side connection of coil.