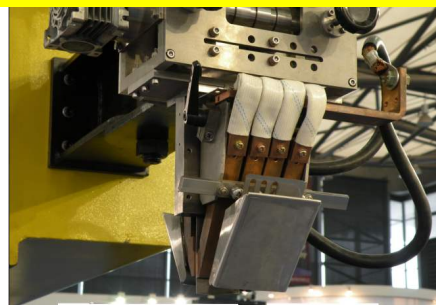


Strip Cladding Solution

Welding/Cutting expert

www.timewelder.com



BEIJING TIME TECHNOLOGIES CO.,LTD.

北 京 时 代 科 技 股 份 有 限 公 司

TIME STRIP CLADDING SOLUTION

1、Equipment application

It is used with anti-floating rotators to realize the inner or outer cylinder cladding. When it is used with heavy duty positioner or overturning equipment, capped end inner cladding or tube plate cladding can be achieved. In addition to that, with appropriate clumper, it can be applied in straight welding of steel plate.

Strip cladding matrix can be carbon steel, low alloy steel etc, the cladding material can be stainless steel, nickel based alloy etc. Generally, strip width can be 30、60mm (optional), strip thickness is 0.4 ~ 0.7mm.

2、Technical characteristics

The comprehensive performance of matrix can be improved after cladding of some special alloy metal.

The strip cladding performance is stable; cladding layer is in good quality with beautiful shape and anti-peel off.

High welding deposition rate, fast welding speed, high efficiency, reducing equipment production cycle and cost.

Low dilution rate ensures the stable chemical composition of cladding layer and equipment's good performance is to be achieved.

3、Equipment composition

TIME strip cladding SAW equipment contains the following parts:

- 1) Soudokay imported strip cladding welding head (optional)
- 2) CED11370C22 220V magnetic steering device (optional)
- 3) TIME PLC strip cladding control system
- 4) SAW welder and power controller (optional)
- 5) TIME TZh heavy duty manipulator
- 6) YS-GHS flux recovering system
- 7) TIME TB1 positioner (optional)
- 8) TIME TR3 anti-floating rotator (optional)

4、Equipment's application condition and environment.

Equipment used in the following environment and condition:

- 1) Installation place: Indoor, keep away from the fierce shaking and bumping area
- 2) Power: Three phase five wire system, 380V $\pm$ 10%, 50Hz $\pm$ 1
- 3) Environment temperature: -10 ~ 45°C
- 4) Continuous working time: $\geq$ 24h

5、Equipment technical parameter

5.1. Strip cladding head (customer chooses according their specific needs)

SOUDOKAY 125-ES1-300.

Imported SOUDOKAY strip cladding head used in the equipment. To meet different demands, SOUDOKAY offers a range of welding heads, details of 125-ES1-300 as following.



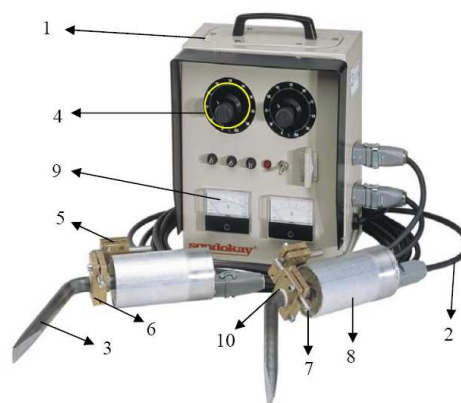
Picture 1 Soudokay welding head

Model	125-ES1-300
Strip width range (mm)	30-60
Wire feeding device	A6 or NA-3SF

5.2. Magnetic steering device (optional)

Magnetic field control cabinet is DC switch power supply with two way voltage continuously adjustable and output polarity changeable. Current value of magnetic head coil is adjusted through output voltage regulation, which leads to magnetic field strength changing. When strip is within magnetic field, strip current is affected, so the strip current distribution changes, magnetic field makes the contracted current spreading all over the strip. When the placing and strength of magnetic field are appropriate, current spreading over the strip is even, and the strip cladding' surface formation improves.

Note: When strip is wider than 60mm, magnetic control device suggested to be used.



Picture 2 Magnetic steering device

5.3. SAW welding power (optional)

When cladding current is small, one ESAB LAF 1601 or one Lincoln DC-1500 SAW welder would be used. When cladding current is relatively heavy, two ESAB LAF1601 or two DC-1500 welders paralleled connection would be needed.

Item	ESAB	Lincoln	Remark
1、Welder model	LAF 1601	DC-1500	ESAB uses digital control, the price is higher then Lincoln's
2、Control cabinet	PEK	NA-3S	
3、Wire feeding device	A6	NA-3SF	
4、Wire feeding speed (m/min)	0.2~4.0	0.43~6.8	
5、Rated welding current (A)	1600	1500	
6、Voltage adjusting range (V)	17~44	16~44	
7、Cyclic duration factor	100%	100%	

5.4. Heavy duty manipulator

Effective travel distance of manipulator: □×□ m (depending on the workpiece)

Loading capacity of the tip of boom: 300kg

Electrical rotating speed of column: 0.08~0.8rpm (Frequency conversion regulating)

Locking method for column: Manual locking

Horizontal moving speed of boom: 0.3~900mm/min (servo regulating)

Moving speed of trolley: 0.24~2.4m/min (Frequency conversion regulating)

Lifting speed of boom: 0.8 m/min (constant speed)

Slide carriage: 200×200

Central distance of trolley guide rail: 2500mm (guide rail P43)

5.5. YS-GHS Flux recovering system (with heat preservation function)

Recovering distance: 4~16m

Recovering speed: 6~12Kg/min

Conveying distance: 8~16m

Working pressure: -12KPa~ -35KPa

Max temperature of flux heat preservation: 150 °C

Flux capacity: 80Kg

Pneumatic pressure: 0.4~0.8MPa

5.6. TIME positioner (optional)

Model: TB1-50 to TB1-500

Loading capacity: 5t-50t

Workpiece gravity: 500mm (tailored according to specific needs)

Workpiece eccentricity: 200mm (tailored according to specific needs)

Overturning speed: 0.15r/min

Overturning angle: Horizontal forward 90°, backward 45°

Cladding linear speed: 0.15 ~ 0.3m/min

Max diameter of cladding workpiece: □m

Overturning angle: n×360(bilateral directions)

Overturning table size:	3m for 25t、 5m for 50t
Electrical conductivity:	2000A

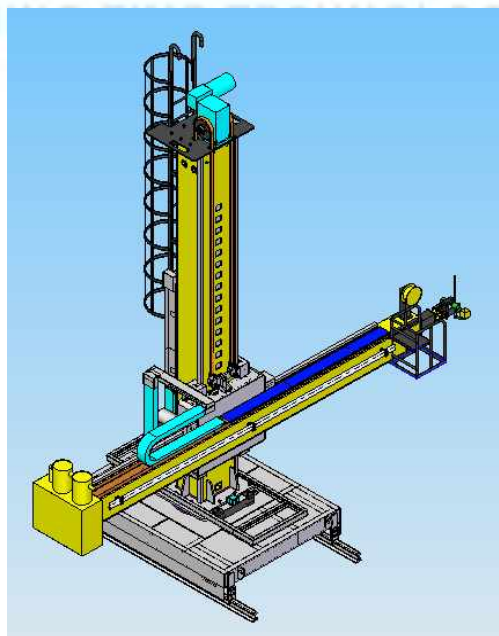
5.7. TIME TR3 anti-floating rotator (optional)

Loading capacity:	□t(according to workpiece)
Roller rotating linear speed:	100~1100mm/min (frequency conversion)
Cylinder diameter range:	□mm~□mm
Roller material:	steel
Center distance of guide rail:	2500mm (guide rail P43)
Height of center of workpiece adjusting range:	±35mm (standard)
Roller diameter:	□mm
Width of roller group:	□mm
Anti-floating precision:	±2mm(standard workpiece)

6、 Introduction of main parts

6.1. TIME TZH heavy duty manipulator

TIME TZH heavy duty manipulator consists of column (lifting device, sliding parts, anti-fall protection device and bob-weight parts), boom (rack, boom driving parts), electrical rotating device etc.



Picture 3 TIME TZH heavy duty manipulator

Column and boom are made of premium steel bent and welded by submerged arc welding. Treated with annealing and stress relieving, the equipment' performance improves with the high precision and wear-resistance advantages. There is no shaking or swinging during the moving of boom.

Boom lifting device is installed on the top of the column; it contains AC motor with brake, turbine worm reduction gearbox, and mechanical driving system with

self-locking function. Lifting chain is installed on rack of the output axis. One end is connected to the sliding device; the other is connected to the bob-weight within the column. There are electrical limit switch and mechanical stopper installed in the limit place of column, so the equipment security can be ensured.

There is a unique anti-fall protection device installed in the boom. In case of the emergency of falling, the device will start automatically to prevent accident. The falling may be caused by overused chain or crashing by external force, the device makes sure the safety of human and equipment is not affected.

Boom's moving speed is 0.3 ~ 900mm/min steplessly controlled. It can meet the demand of $\phi 4000$ mm cylinder inner helix cladding at the speed of 100mm/min.

Sliding device moves on four positioning guide wheels, other four wheels are used to fasten the boom to make it moving horizontally.

Using pinion and rack for boom's moving, driven by servo motor, the equipment has a wide range of speed regulating with high precision and stable performance.

Manipulator rotating device is in high precision, so the lower flexibility is small.

During column's rotating (driven by servo motor steplessly) on the trolley, the rotating base keeps horizontally all the time. The rotating angle is $\pm 180^\circ$, manual locking device applied.

TIME TZH heavy duty manipulator's distance of guide rails is 2500mm (distance between center of rails/P43). According to the travel distance of trolley, tank chain will be equipped (optional). Manipulator moves smoothly without slipping, cracking or shaking. Drag chain wiring method is adopted for electrical supply to avoid damage.

- Space left for hose in boom and column (welding wire, control wire)
- There is a hoisting hole on the top of manipulator for convenient transportation.
- Ladder is installed for convenient operation and repair.
- Alarm light installed on the top of manipulator for indicating crane's work;
- Control buttons are in hand operating device and main control cabinet, interfaces are left for connecting it to anti-floating rotator or positioner;
- Main control cabinet, welding power, air dryer are installed on the base of trolley.
- phase sequence relay used for protection in the cases of over-voltage, under-voltage, under-current, under phase. Safe power plug-in installed on welding head operation panel with low voltage light and fan.

6.2. TIME strip cladding control system

Parameter

It consists of main control cabinet, man-machine interface, hand operation device, see following details:

- 1) PLC model: Mitsubishi FX3U series
- 2) Man-machine interface: Mitsubishi GOT-10 series
- 3) AC servo driver: Mitsubishi MRE series
- 4) AC servo motor: Mitsubishi HF-KP series
- 5) Frequency transformer: Mitsubishi FR-A700 series
- 6) Low voltage electrical parts: Schneider、Meanwell etc

Mitsubishi FX3U PLC is used to control one set of AC servo device. Servo motion system does programming by absolute value system, it can memorize and store the real time parameter with power-off and malfunction memory functions.

Man-machine interface is installed on welding head, using Mitsubishi with high sensibility, high definition 256 color GOT-1055 touch screen. It has both Chinese and English menus, all welding and axis moving parameters can be set, stored, used, and modified anytime on touch screen, easy and convenient. Man-machine interface has the function of real time monitoring, so the motion and welding parameter can be observed conveniently.

Low voltage electrical parts use Schneider or Omron brands. Electrical control cabinet designed according to the CE standard with good insulation to avoid electromagnetic interference.

Except the parameter should be input on man-machine interface, all other functions can be completed in hand operation device, like welding start/stop, alarm, emergency stop, wire feeding and withdrawing, flux conveying and recovering control, servo axis motion control, all other parts' control, anti-floating rotator or heavy duty positioner jointly control.

Electrical control system

- 1) During tube plate's cladding, manipulator and positioner can be jointly controlled. If rotating coder is installed on overturning table, welding bead changes automatically after workpiece rotates each circle through boom's extending, and making sure stable linear speed on different circumference. If rotating coder not able to be installed on positioner, these procedures can only be realized manually.
- 2) Manipulator and anti-floating rotator can be united used during cylinder' inner wall or outer surface cladding. If rotating coder is installed on rotator, welding bead changes automatically after workpiece rotates each circle through boom's extending. Welding changing includes helix and skiing styles. If not, these procedures can only be realized manually.
- 3) Manipulator and positioner can be united used during capped end's cladding.

Generally, after each circle, welding should be paused for a while, welding bead arrangement should be made by boom's extending and positioner's overturning.

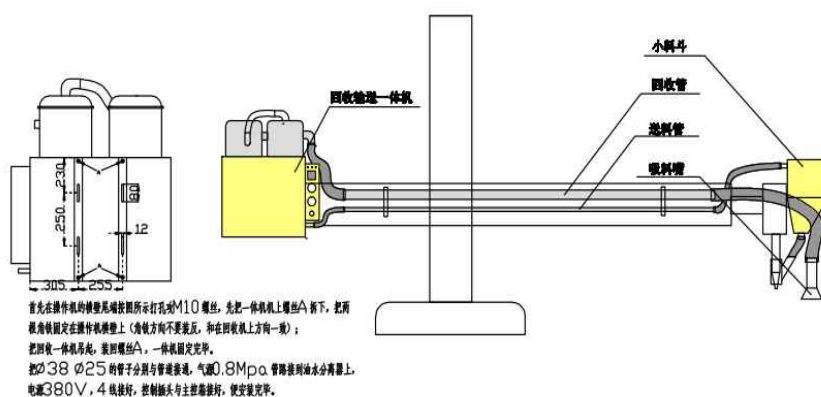
4) Before welding, welding current and voltage are preset on welding power source control cabinet, while welding speed is set on man-machine interface and fine tuned during welding. Welding current and voltage are shown on control cabinet and fine tuned during welding in real time.

5) Automatic or manual welding can be chosen for strip cladding. Workpiece's size, welding strip width, lapping width, welding speed should be input to the man-machine interface for both methods, the difference is automatic welding will make welding bead arrangement and welding linear speed regulating automatically, while in manual method, when to change the welding bead is decided by user (Easy to operate, just push the "manual changing" button). Manual welding is usually used for the situation where coder not installed.

6.3. Flux recovering system

Flux recovering system consists of conveying device, hopper, stainless steel tube and connection hose. The conveying device is equipped at the end of boom, through stainless recovering, conveying hose connects to the hopper and flux sucking mouth, as the flux feeding and recovering system is completed.

There is a flux heat preservation device in this system, and it is automatically controlled. Flux recovering system can be easily controlled by hand operation device.



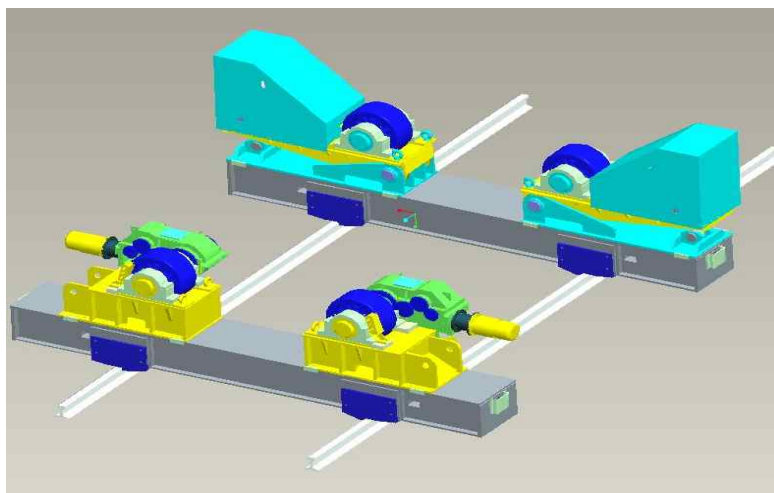
Picture 4 YS-GHS flux recovering system

6.4. TIME TR3 anti-floating rotator (optional)

TIME TR3 adjustable automatic anti-floating rotator, which is positioning equipment makes workpiece rotates by the friction between powered roller and workpiece. During the rotating, idle rotator goes up and down automatically to avoid workpiece's axial floating. The rollers' center distance is adjusted according to different diameter of workpiece.

TIME TR3 adjustable automatic anti-floating rotator consists of power rotator, idle

rotator and detecting framework, like picture 5. Power rotator is driven by frequency conversion with brake AC motor; it has features like wide speed regulating range, rotating smoothly etc. Idle rotator' lifting device is driven by cycloidal pin gear AC motor, when there is a axial floating signal sent, rotator goes up or down automatically to adjust workpiece's position. Floating value is transformed to analog signal to adjust the height of rotator



Picture 5 TR3 adjustable anti-floating rotator

TIME TR3 characteristics

Adopting frame structure made of welded steel to make sure good rigidity and stability.

- 1) Steel covered with polyurethane material for rollers with great loading capacity, long life-span and avoiding damaging workpiece.
- 2) Helix grounding makes sure reliable electrical conductivity during welding in heavy current.
- 3) Eight rollers on power rotator are driven by turbine worm reducer.
- 4) The lifting device of idle rotator consists of AC motor, cycloidal pin gear reducer, turbine lead screw elevator.
- 5) Detecting framework consists of expansion link, detecting roller, rotating coder, sliding carriage, installation framework etc.
- 6) Expansion link consists of guide rail and connecting plate. Workpiece's floating value is detected by detecting roller and transformed to electrical signal into detecting cabinet, then calculated by controller to adjust the height of roller to avoid axial floating.
- 7) Slide carriage is a lead screw nut device, used for adjusting the detecting roller manually. Framework is made of hollow steel tube to support slide carriage and detecting cabinet.

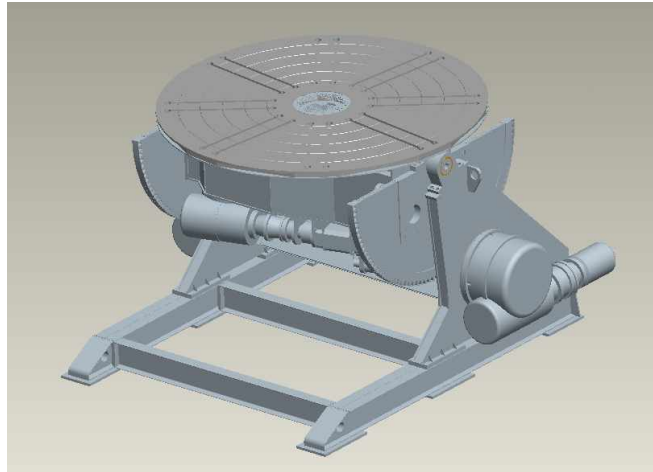
6.5. TIME TB1 welding positioner (optional)

As indicated in picture 6, TIME TB1 welding positioner adopting single seat type overturning structure, is composed of frame body, base, driving system, overturning device and working table, crossbeam, safety device, electrical conductivity device,

lubrication, cooling water circulation and controlling system etc.

1) Body

The framework type is used for positioner body to ensure good rigidity and stable performance is to be achieved. Hook is integrated for crane's work.



Picture 6 TIME TB1 welding positioner

2) Base

Base is made of steel with great loading capacity.

3) Driving system

Driving system contains overturning and rotating parts.

Overturning driving system:

It consists of DC motor, DC driver, electromagnetic clutch brake, speed/position coder, cycloidal reducer, turbine worm reducer and small gear wheel etc.

Rotating driving system

It consists of AC motor, cycloidal reducer, turbine worm reducer, and small gear wheel etc.

Overturning motor uses AC motor with brake, rotating reducer' high speed grade uses electromagnetic clutch brake. Double braking protection used to ensure the precision and safety of equipment's stopping.

4) Rotating device

Rotating device used for circular welding during rotating.

Mainly consisting of rotating support, rotating table, driving system etc.

Rotating support adopts German technology with great loading capacity and high precision.

Water cooling device is installed under rotating support to take part of heat away produced by rotating support and crossbeam. Temperature is lowered for normal operation.

Double self-lock structure is used for safety reasons.

5) Overturning device

Working table overturns to make workpiece in the best welding position.

6) Crossbeam

Crossbeam is used to support the workpiece, it bears the loading and twisting force.

7) Working table

There are at least 8 radialized "T" shape grooves in the working table, used for fastening workpiece. Several round grooves added to position the center of workpiece. Working table is fastened on rotating support, making sure stable load bearing and rotating.

The pre-heating temperature on the working table can be as high as 300℃.

8) Safety device

It includes emergency stop switch, travel limit switch, turbine worm reducer, electromagnetic brake motor, electromagnetic clutch brake, over-current protection and over-heat/cool protection devices.

9) Electrical conductivity

It consists of copper rod, conductivity ring, and spring etc.

Insulation treatment is made between conductivity device and crossbeam, avoiding damage by electrified bearings.

10) Position control system

The equipment is powered by 380V±10%, 3phase, 50Hz±1 Hz, alarmed beyond the scope.

Control system contains main control cabinet and hand operation panel. It can be joined by manipulator to realize comprehensive operation.

7、Supplying list

No.	Item	Quantity	Brand
1	TIME TZH heavy duty manipulator	1 set	TIME
2	Strip cladding head (optional)	1 set	SOUDOKAY
3	Magnetic steering device CED11370C22 220V (optional)	1 set	SOUDOKAY
4	TIME strip cladding electrical control system	1 set	TIME
5	200×200 heavy duty sliding device	1 set	TIME
6	PLC and servo system	1 set	Mitsubishi
7	ESAB LAF 1601/ Lincoln DC-1500 (optional)	1 set	ESAB/ Lincoln
8	Wire feeding machine A6/ Lincoln NA-3SF	1 set	ESAB/ Lincoln

9	PEK controller/Lincoln NA-3S	1 set	ESAB/ Lincoln
10	Flux recovering system(including air dryer)	1 set	Yuansheng
11	TR3 anti-floating rotator (optional)	1 set	TIME
12	Cooling water tank LXII-20	1 set	RST
13	TIME TB1 positioner (optional)	1 set	TIME
14	Cable for welder (4x35mm ²)	10m	Outsourcing

Note: Standard power cable is 10m.

8、Documents attached

One set of English technical document supplied:

- 1) Quality certificate and warranty card (1 copy)
- 2) Equipment installation manual (1 copy)
- 3) Equipment user's guide(1 copy)
- 4) Equipment base drawing and main rapid wear parts indication drawing (1 copy)
- 5) Electrical control drawing (1 copy) .

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