

(DF-DL400/13DH) High Speed Copper Rod Drawing with Continuous Annealing Machine Line

I. Machine line description

DF-DL400/13DH high-speed copper rod drawing with continuous annealing machine line is used for copper rod drawing from $\Phi 8\text{mm}$ to $\Phi 1.2\text{mm}-\Phi 3.5\text{mm}$. Drawing dies are arranged in one line, continuous drawing with online annealing, mechanical and electrical system speed is balanced matching, convenient operation, can quickly change drawing dies, non-stop automatically change wire taking-up barrels. This machine has the advantage such as: easy to operate, high production efficiency, good product quality, etc.

1. Main equipment technical parameter

Max. Inlet Diameter	$\Phi 8\text{mm}$
Outlet Diameter Range	$\Phi 1.2\text{mm}-\Phi 3.5\text{mm}$
Max. Drawing Speed	25m/s
Drawing Cone Diameter	$\Phi 400\text{mm}\&500\text{mm}$
Capstan Diameter	$\Phi 400\text{mm}$
Max. Drawing times	13 times
Max. Wire Length in the Storage Device	7m
Capacity of Barrel Type Wire-taking up	2t
Wire Taking-up Diameter Range	$\phi 3.5\sim\phi 1.2\text{mm}$
Wire taking-up Speed Max.	25m/s
Mechanical Elongation	8%-46%
Drawing Machine Motor	Z4-315-22 280KW 1000r/min DC
Capstan Motor	Z4-160-32 75KW 1500r/min DC
Lubrication Pump Motor Power	AC 3KW
Max. Annealing Current	5000A
Max. Annealing Voltage	55V
Total Installed Capacity	780KVA
Total Dimension size (L×W×H)	28,220mm×4500mm×4400mm

2. Main equipment composition

This equipment includes the following main units such as: wire pay-off rack, wire end rolling machine, main drawing machine, annealing device, vertical tension control wire storage device, barrel plum type wire take-up device, drawing emulsion system and the gear box lubrication system, electrical

control system, etc.

3. Wire pay-off rack introduction

The device is of gantry swing arm structure. Before the pay-off, the wire is adjusted straight by the guide wheel. Guide roller or guide bush is applied to each guide wheel against the dropping or looseness of the wire. Automatic switch between two working positions can be realized: when the pay-off ends at one working position, the wire will automatically swing to the working position above another wire circle. The rack is 4.18m high and has the function of wire jamming detection. In case of wire jamming or pseudo-death caused by the wire knotting, the main machine can come to a sudden stop automatically, ensuring the safety of both the machine and the staff. Sudden stop button is also available on the rack for emergencies.

4. Wire end rolling machine

This machine is used and matched for wire drawing, to tip the wire end by rolling and cross the wire drawing dies, the rolling head has the function to cut the copper rod.

Roller diameter	Φ100mm
Roller rotating speed	24r/min
Rolling Diameter range	Φ1.7mm-Φ12mm
Capstan diameter	Φ430mm
Motor power	4KW

5. Drawing machine introduction

The copper rod drawing unit is driven by two sets of DC motor, host drawing motor is driven by 280kw DC motor, by gear box decelerated transmission to the 12 drawing capstan shaft, bearings can be selected of domestic made or imported according to client's requirement, the drawing dies is arranged as German Nihoff Company Quick Die change way; gear box helical gear part material is 20CrMnTi, by cementiting and quenching process, surface is hardened; drawing capstan surface is made of alloy steel, the surface is processed by heat treatment or tungsten coating method, the hardness $HV \geq 850$, Long use life; drawing capstan is combination type. Drawing dies moulds rack is made of casting. Outlet drawing dies can be rotated to ensure that the roundness of the finished wire.

Main drawing machine keeps a certain distance between the gear box and drawing emulsion box, the bottom has the backwater gutter to prevent the gear box has drawing fluid leakage.

- 1) The machine base is of welding structure and is made of annealed material Q235-A. Taking shape after the elimination of the internal stress, it

is used to hold the gear box as well as to serve as the backwater tank, collecting the cooling liquid which effuses from the drawing cooling liquid box.

- 2) The gear box body is of annealed welding structure. High-precision lathe gear and imported bearings are used. The cooling and lubrication is of the spraying and forced oil type. With the gear, the belt wheel and the main axle all being treated with dynamic balance, the machine is of smooth operation, reliable transmission, low noise and long service life.
- 3) The drawing cooling box employs full immersion lubrication cooling. The thorough cooling and lubrication of the drawing cones, dies and the wire ensure the best drawing quality.
- 4) The maximum drawing times amounts to 13. The drawing cones are of composite structure. The surface is sprayed with tungsten carbide. With a hardness of $HRC65 \pm 2$, the drawing cone is of good wear resistance, easy maintenance and long service life. The drawing cone diameter is of 400mm and 500mm. The maximum outer diameter for the die is 50mm.
- 5) The capstan diameter is of 400mm. It adopts 75KW DC motor, in coordination with the drawing section. One only has to input at the control interface the actual die values and the desirable sliding parameters. The machine can automatically adjust the speed ratio of the two motors. One does not need to move the dies to make the wire go from the corresponding drawing cone to the capstan. This can reduce the times of going through the dies, enhancing the production efficiency.

The main machine noise $\leq 85dB$ (other than the main motor).

6. Annealing device application and main technical parameter

1) Application

This annealing machine is matched with the copper rod drawing machine, has continuous annealing to the drawn $\Phi 1.2 - \Phi 3.5$ copper wire to produce the soft copper wire.

Annealing device is designed as lean type, the height is reduced, so that when the operator can cross the wire, do not need climb the ladder up and down. Specially designed ventilation pipe is used to supply air to the annealing wheel rear part, cooling annealing brush and shaft. The annealing rear wheel becomes very simple, convenient for routine maintenance.

2) Main technical parameter

No.	Specification	Unit	Value
1	Annealing wire diameter range	Mm	$\Phi 1.2 - \Phi 3.5$

2	Annealing speed	M/S	25
3	Max. Annealing Current	A	5000
4	Max. Annealing Voltage	V	55DC
5	Contact wheel diameter	mm	Φ 400
6	Annealing way		Three sections resistance DC type
7	Cooling water box capacity	L	约 1800
8	Needed plate heat exchanger cooling water quantity	m ³ /h	30
9	Annealing cooling water pump motor power	Kw	4
10	Needed steam working pressure	MPa	≥0.2 (Steam generator prepared by client)
11	Compressed air wastage	m ³ /h	50 (Air compressor prepared by client)
12	Compressed air working pressure	MPa	0.4-0.6
13	Machine overall dimension size	M	4100×1200×2300

7. Vertical tension control wire storage device

This device is to match the two barrel wire taking-up in the starting, stopping and the barrels changers, as a compensation for wire speed minim, wire storage length is 7m, tension is by pneumatic tension control, air pressure adjustable. Air source pressure is 0.3 ~ 0.6Mpa adjustable.

8. Barrel plum type wire taking-up device

800 barrels type Plum wire taking up device means that wire is taken up by barrels with hurdle. It is formed by the machine rack, circle type wire drop off device, wire storage device, plate transit unit, brakes and electric control system. Take-up machine uses AC frequency control, wire drop off device is by eccentric rotating design, so when the wire is dropped off, it forms into a plum-shape, this make the taken-up wire has high loading density and easy pay-off advantage. The wire take-up machine has the counting function, when the wire taken-up reaches the set value, the system will give audible and light alarm, the operator can control the wire storage device and barrel transit system by the control panel on the machine line and manually cut off the wire and switch the wire storage rack, to reach the purpose of continuous non-stop production.

1) Technical parameters

Parameter Name	Parameter Value
	800 barrel type plum wire take up device

The maximum wire form circle speed (m/min)	1500
Taken up wire diameter range (mm)	1.2~3.5
Form circle barrel diameter (mm)	800
Barrel hurdle size (mm) In. Diameter×Out. Diameter×Height	Φ 580×Φ 1050×1600
Wire take up barrel capacity (kg)	Max 2000
Wire take up motor power (kw)	AC 18.5
Barrel transit motor power (kw)	0.75
Dimensions (mm) L×W×H	4280×3800×4550
Machine net weight (kg)	About 8000

2) The main selected components

- A. Bearing is mainly by Japan NSK brand
- B. The main motor is by Wannan Motor Factory produced AC motor.
- C. Capstan surface is ceramic spraying treatment .
- D. Inverter is Japan Yaskawa brand.

9. DF-SP630 pneumatic type 2 bobbin automatic wire take-up machine

1) Equipment Introduction

2 bobbin automatic bobbin change and wire take-up device is longitudinal arrangement .The cabinet is made of high quality steel weldments, after annealing treatment, with good stability. Choose high quality pneumatic components, full pneumatic control, working pressure, traverse pitch all can be adjusted .Total pneumatic pressure control to load and unload the bobbin, clamp and loosen the bobbin. With tray removable function, make it easy to change the bobbin take off bobbin thimble. The machine pneumatic system uses energy storage, electromagnetic valve gas circuit adopts integrated block combination, ensure the reliable and safe operation. From blank to full bobbin, whole process has electric automatic control

Action description: for example if the right first start to take up the wire, when reach the fixed length meters, will give signal, protection gate open, right bobbin removable shield cylinder action, left bobbin switch , when the traverse wheel reach the second approach switch position, traverse frame motor switch, through the chain pull traverse frame move to traverse frame approach switch position one, produce a

signal , with time delay to transfer to approach switch of wire catch up device, wire hook in function of the cylinder, catch the wire and downward rotate, wire capture device begin to capture the wire, bobbin change succeed , catch wire hook reset, right bobbin brake, protective gate reset, traverse frame moves to the approach switch position two, left bobbin normally take-up the wire, right bobbin manual to change the bobbin .

2) Technical parameters

Bobbin change speed	8-12m/s
Wire take-up motor	AC 22kW (2 pcs)
Max. traverse width	485mm
Traverse pitch	Max. 6mm/r stepless adjustable
Wire take-up bobbin type	PND500~630

3) Main components selection

- A. Frequency converter is TECO brand.
- B. Low voltage electrical components, bearing , pneumatic components uses the Japanese or Taiwan brand
- C. Wheel is ceramic spraying processing
- D. Take-up motor using china made ac asynchronous motor

10. Drawing lubrication and cooling system

Driving gear in the cabinets is lubricated by the oil pump motor, equipped with plate heat exchanger. Drawing cooling is by dip-jet type: drawing liquid immerge drawing capstan 3 / 4, drawing die using a forced spraying of cooling lubricant to improve the life of drawing dies. Drawing coolant circulation system, includes drawing liquid tank, filters, plate heat exchanger, drawing liquid circulation pump.

- Gear type lubrication oil pump** CBZ-70 70 1/min 2.5Mpa 4kw
- Plate heat exchanger** BR0.1-1.6-3-N Path:25 Heat exchange square:3m²
- Twin metal thermometer (2 pcs)** WSS-411 Φ100mm*1000mm
- IS type single-stage centrifugal pump** IS65-40-200 7.5kw Flux 25m³/h
Raise distance 50m
- Plate heat exchanger** BR0.2-1.6-15-N Path: 65 Heat exchange square15m²
- Twin metal thermometer (2 pcs)** WSS-441 Φ100mm*1500mm
- Pipe heating element (5 pcs)** SRY2-220/4 N=4kw L=922mm
- Twin barrel filter** SLQ-65 Precision 0.08 Square 0.52m² Pass ability 760

l/min

11. Electric control system

DC Annealing Breakdown drawing machine electric system drive scheme (Fieldbus communication with RS485 control mode)

1) Main technical parameters:

A. Equipment technical criteria:

Total power:	860KVA;
Outlet diameter range:	φ 1.2-3.5mm;
Max. Wire speed:	25M/s;
Max. annealing voltage:	55Vdc (DC annealing);
Max. annealing current:	6000A (DC annealing);

B. Main electrical technical parameters:

Drawing DC motor:	280kw 440Vdc	1 pcs
Capstan DC motor:	75kw 440Vdc	1 pcs

2) Main electrical configuration:

A. System inspection parts configuration :

M510T (10.4 "Colored man-machine interface)	1 pcs
CQM111 series PLC (Japan ORMON product)	1set
RS232/RS485 communication interface	2set

B. Driven system main parts configuration :

For drawing motor:	6RA2885-6DS21 SIEMENS DC converter	1 pcs
For capstan motor:	6RA2875-6DS21 SIEMENS DC converter	1 pcs
For annealing power supply control:	U.S. ENERPRO adjustment plate / power unit	1set
Annealing transformer:	420KVA (dual star)	1 pcs

3) Electrical control scheme:

A. Electrical system operation:

Two-way communication data exchange between the man-machine interface touch screen and the PLC is by the serial RS232, through the PLC program control to realize the system monitoring and control. Two-way communication data exchange between the PLC with the drive DC speed adjustment device is by RS485 (annealing power supply unit is controlled by PLC, D / A -A / D digital-analog conversion), control and monitoring the device state of each unit, to achieve three level computer control system.

The electrical system operation platform settings are: the power control switch, full line emergency stop button, M510T interface,

all the major operations are carried out here.

Operate Another set: pay-off line chaos, break, tension and other detection limit of the beginning of tension detection potentiometer, wire-speed tachometer, cable, fixed-speed DC motor with rotary encoder feedback. take-up button operation boxes, is in the machine frame part.

Other setting are: wire paying-off chaos, wire breakage, tension limit detection switches, tension detection potentiometer, wire-speed calculating meter, drawing, fixed-speed DC motor is by rotary encoder feedback.

Wire speed is set by the man-machine interface touch screen electronic potentiometer to adjust wire drawing speed (including the dies selection operation of the quick die change operation), capstan, wire taking-up, closing line (RS485 serial communication), through the tension detection potentiometer and wire-speed automatic speed calculating machine to adjust the wire taking-up speed; annealing power through the man-machine interface touch screen electronic adjustment potentiometer (fine-tuning and procedures for root operation) wire speed automatic tracking; system can: the single and the whole machine's start / stop operation, the work status of the speed control device and fault alarms, the work status of the complement and fault alarms, wire take-up work state, wire storage device condition monitoring, systems work control, etc. Also the machine can: the current wire speed (unit: m / min) display and the current and pre-setting meter calculating display (meter to automatically bobbin change or alarm).

B. Electrical system settings:

The whole system has one general power switch, the DC converter / voltage adjustment device's main circuit all has fast fuse protection, all kinds of fault has automatic chain protection by the speed / voltage regulator inside the unit of the system; auxiliary motors are all by protected by using breaker protection.

Main operation is set in a type 500 operation platform; double bobbin wire taking-up operation has a button operation box; the general power switch is set in one 600 type switches control cabinet; drawing, fixed speed governor device, complement control devices, etc set in a 1000 type drive control cabinet; Double Take-speed device, auxiliary control devices such as set in a 1000 drive control cabinet; PLC and auxiliary control devices are set in a 800 type

drive control cabinet; annealing power control and power unit are set in a 1200 type annealing control cabinet; annealing transformers is set in a protective cover cabinet.

4) System supporting:

Main operation platform:	1 unit
Button box:	2 units
Transmission control cabinet:	5 units
Annealing transformer cabinet:	1 set
General Electric and cabinet installation diagram drawing :	1set
Electric principle chart:	1 set
Electric wiring diagram:	1 set
Connection data sheet:	1 set
Electric Manual:	1
6RA28 series Siemens DC converter Manual:	1

II. Remarks:

1. **Trade term** : FOB Shanghai
2. **Payment term** : By irrevocable L/C at sight
3. **Delivery date** : 100 days after receipt of the L/C
4. **Warranty period:**

Within one year after the machine commissioning and acceptance of the buyer because of design and manufacturing fault of the seller, the seller is responsible for free repair, if the fault is because of machine natural wear and tear or caused by improper use of the buyer's, only the materials fee charged.

5. Service :

The seller will provide the buyer a full set of drawings for installation and debugging, Based on these drawings the buyer will arrange his own personnel to install the machine, after the installation completed, the sellers are responsible for the final stage precise debugging.

When the buyer complete the installation and request the seller for the machine final stage debugging, the seller should provide the specific engineers passport information within 7 days to the buyer for sending the invitation letter and visa application, and the seller engineers should arrive at the machines location within 30 days.

The cost of air-ticket to and back from the buyer, the accommodation on the buyer' s side is born by the buyer and the buyer pay the seller' s engineer USD40 per day for each person as the allowance during the debugging period. And the final success debugging is based on the debugging report signed by both sides. The success debugging and staff training is generally no more than 20 working days.

After the final success debugging, if the buyer request the seller to have one engineer to stay a few more days for the machine operation instruction, if the seller agrees, during this period, the buyer should pay USD50 per day for each engineer as his salary.

SWAN INT'L
西万国际