

XP-W type magnetic medium  
controlling X-ray pipeline crawler

User Instruction

Dan Dong NDT Equipment Co.,Ltd.

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## XP09/15/18/26-160/200/250/300W type X-ray pipeline crawler

### 1. summary



XP series X-ray pipeline crawler is a new type of testing equipment for pipe welding. It applies magnetic source controlling, the whole set machine can control by operating the magnetic source. While under this kind of controlling mode, we can avoid the damages from the gamma source radiation for the body, especially suitable for works in the foreign country.

### 1.1 functions

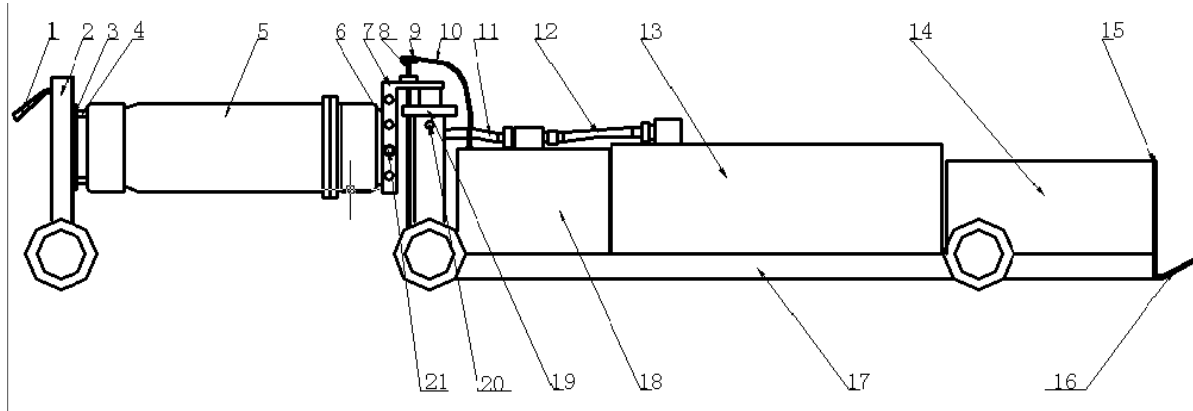
XP wireless remote controlling pipeline crawler is a X-ray non-destructive testing equipment, suitable for the welding inspection of oil 、 gas or other fluidity chemical products pipelines.

### 1.2 features

- With applying Frequency conversion power supply technique, the definition of film's photographing have a remarkable improvement, it has the features such as consistence darkness and not influenced by the voltage of battery.
- Applying with the different configuration, XGP pipeline crawler runs more placidity. It will not be turned over in the course of running.
- magnetic source controlling can let the operation of pipeline crawler without requirement of, command resources so to reduced the management fees of crawler, and also reduced the command resources radiation to bodies .
- Complete functions, also has the protect features of low voltage and so on.
- XGP pipeline crawler has self-save function, if there has failures in local circuit, it will automatically back out after half an hour or you can change another save board or crawler to save the equipment out.
- Power cut maintain functions: can keep seven days of one set value exposure and running time, if

the using time of equipment over seven days, can reset the time of exposure and running.

**2. Sketch of system configuration and installation: please according to the map install the pipeline crawler.**



1 fixed handle 2. X-ray generator head adjust bracket 3. X-ray generator head fix board 4. underlay bar 5. X-ray generator 6. X-ray generator back fix panel 7. X-ray generator back adjust bracket 8 .magnetic receiver bracket 9. magnetic receiver 10. magnetic receiver connect cable 11. X-ray generator connect cable 12. power supply connect cable 13. battery 14. control part 15.back panel 16. trail end ring 17.crawler part 18. X-ray control part 19. X-ray generator back adjust cable 20.tight screw 21.limit screw

**equipment installation and notices:**

after open the boxes, please install the equipment according to the above chart , the installation order as following:

- connect X-ray generator with X-ray generator up-down adjust bracket;
- connect X-ray generator with car body through (5) programme ;
- adjust the highness of X-ray generator by X-ray generator up-down adjust bracket, let the centre of generator and the centre of inspected pipeline coaxial ;
- install the battery box on the crawler and connect the power supply cable;
- according to the programme 4.4 in this specification to test magnetic indication status
- when it needn't exposure, do not connect the X-ray generator with control unit ;
- After finish the checking, if needs exposure, connect the X-ray generator with control unit well and put the crawler into the pipeline, then start to work.

**3. the main technical parameter**

#### 4. operate way

##### 4.1 charge of battery

standard parameter	XGP-160W	XGP-200W	XGP-250W	XGP-300W
Inspection tube diameter	Φ210-420mm	Φ381-780 mm	Φ450-1200 mm	Φ660-1500 mm
	If need to enlarge the pipe diameter limitation please illuminate when ordering, we will modify the equipment for you			
battery	8AH	12AH	17AH	20AH
Running distance	8KM	10KM	10KM	10KM
directional definition	±5mm	±5mm	±5mm	±5mm
Max gradient	30°	30°	30°	30°
Control way	magnetic indicator			
Magnetic penetration	Below 20mm	Below 20mm	Below 20mm	Below 20mm
weight	116kg	120kg	146kg	155kg
length	2300mm	2000/2300mm	2365mm	2465mm
speed	18m/min	18 m/min	18 m/min	18 m/min
Exposure time	adjustable	adjustable	adjustable	adjustable
Exposure voltage	80KV-160KV	100KV-200KV	150KV-250KV	200KV-300KV
	6 levels adjustable, advise use five level normally			
Exposure current	3mA	3mA	3mA	3mA
Work voltage	DC120V	DC120V	DC120V	DC120V
Work temperature	-10 °C-60 °C	-10 °C-60 °C	-10 °C-60 °C	-10 °C-60 °C
Penetration Fe(mm)	10mm	18mm	28mm	40mm
Beam angle	360 °X24 °	360 °X24 °	360 °X24 °	360 °X24 °
Swerve semidiameter	7D	7D	7D	7D

##### 4.1.1 charge of crawler battery (please notice to insert the charge connect line after open the

**power supply switch)**

- Check and confirm electric net AC voltage in the range of 180-250V.
- Connect well the charge power supply connect line, open the switch of charger, confirm if the DC voltage meter indicates about 138V, adjust the current rotary key until minimum value.
- Connect well the charge connect line, (pay attention to polarity )aim at gap on the battery box socket then insert the plug, check if the voltage meter indicates about 120V, adjust the charging current to 1.5A (for XP18-250W, XP26-300W is 1.9A).
- After charge for some times, the voltage meter indication would gradually up to 138V, then stop to improve, the charging current will gradually reduced until nearly 0, close the power supply switch, cut off the charge connect line, charging finished.
- When completely discharging, the charging period is about 10 hours.

**4.1.2charge of magnetic radiator**

- check & confirm the AC voltage in the range of 180-250V
- connect the charging cable with magnetic radiator, start charging
- normally the charging time during one time of complete arc period is about Four hours

**4.2 preparation before the running**

- before install the equipment you should confirm:
- if the X-ray unit power supply plug didn't connect
- if the switch of crawler power supply is in the close place
- if the battery has charged completely
- if the X-ray unit has aged already or do not need to be aged.
- if it is the first time of using or after changing the pipeline diameter, you need to adjust the location of X-ray unit centre place and image head .
- at first should put the X-ray unit into the pipeline, then put the crawler into the pipeline and connect with the X-ray unit.
- after confirm the X-ray unit switch in the location of close, insert and screw down the cable connection plugs of crawler and X-ray unit, adjust the high voltage setting keys to the used voltage. (if long time didn't use, please open from lowest KV value and aging according the specification then up to higher voltage)

- installed the battery into the crawler, connect well and screw down the power supply cables of battery and crawler, at this time the switch of crawler should be close location.
- Choose the command source or wireless controlling way according to the control mode on the back panel (for example, if rotary the key on the position of source it means you have chosen controlling by command source)
- open the crawler power supply switch, the back voltage meter should indicate the battery voltage.

#### **4.3 setting of exposure time**

##### **4.3.1 setting of magnetic controlling mode**

After turn the crawler power supply on, open the command source by key, rotary it to the source position.

Press the function indication key, **pipeline crawler will hint you the time by one time per second discontinuous sounds, the persistence time of every discontinuous sounds per second is the exposure time set by you.**

Not need to set the exposure time in every running, if not change the tube diameter and wall thickness, do not need to set the exposure time, at this time, the exposure time will remain the parameters of last time, if not reset, it will remain this exposure time for seven days after last running.

#### **4.4 running of crawler**

##### **4.4.1 running of magnetic indicating (standard type)**

###### **4.4.1.1 overview of magnetic radiator**

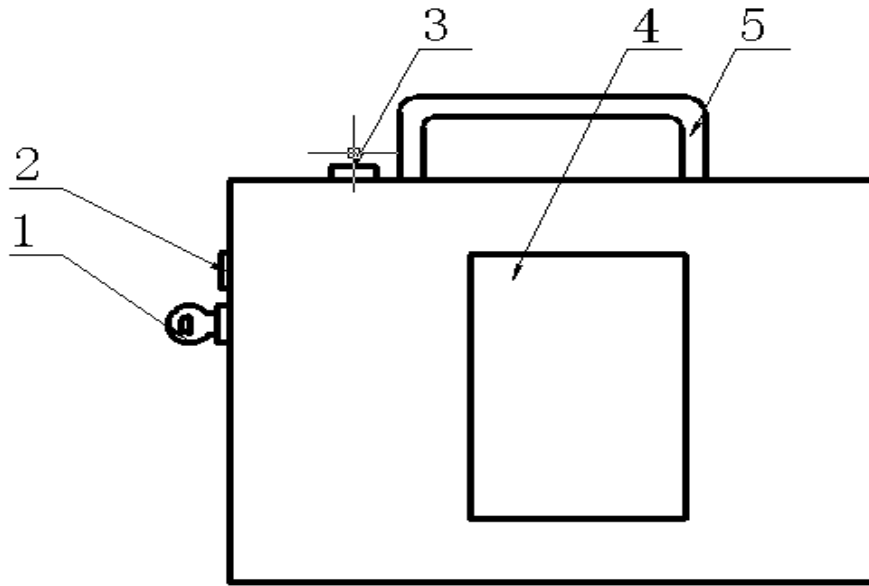


diagram 2

1.key switch: if close the whole switch of magnetic radiator, the setted parameter will be lost, and return to the original value.

2.charging socket: use during charging of magnetic radiator. It can use more than four hours, please charge it on time, or it will appears lose-controlling result, if the magnetic radiator stayed for long time, please charge first to assure can use safely.

3.electrical-saving switch: if the magnetic radiator stayed for some time and will not need to change the parameter for the next time using, please close the electrical-saving switch to save power.

4.board: please refer to 4.4.2.3 about how to set the parameters for magnetic radiator.

5.handle: something used for move the magnetic radiator.

#### 4.4.1.2using of magnetic radiator

Put the well connected crawler into the pipe(short pipe suggested), underlay the driving wheel(a pair which located in the end of crawler)(distance between wheel and pipe wall must less than 30mm, or will affect the parameter's setting), adjust the magnetic receiver <90mm apart from pipe wall(<5mm suggested). Please put the magnetic radiator on pipe wall which is in vertical position of magnetic receiver, turn key switch to X-ray on, leave 1-2m between magnetic indicate radiator and pipe brink, or it will affect setting for parameter. At first, turn key switch on, turn electrical-saving switch on, then set the parameters on the board (detail refer to 4.4.2.3), adjust magnetic strength bigger and bigger, until the blue lamp of magnetic receiver lights, then improve 3-4 unit parameter, if the magnetic radiator stayed for



some time, and will not need to change the parameter for the next time using, please close the electrical-saving switch ,it can not only save power, but also will not lose data, but please not turn off the key switch, or the will lose all parameters.(remarks: position of magnetic radiator should be continuous correct and precise, or it will influence the indicate precision & lead into bad results.

4.4.1.3specification of magnetic radiator board

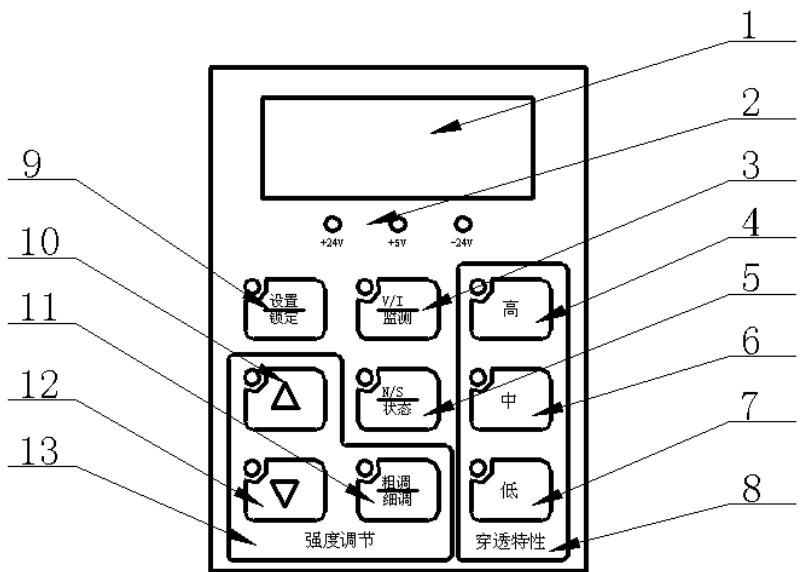


diagram 3

- 1.digital displayer: monitor magnetic strength, big value means big magnetic strength.
- 2.inside voltage indicate:3 indicate lamp lights in normal working status
- 3.monitor switch of voltage & current value: default value suggested. This default value is monitor current value (equals to magnetic strength), it monitors inner voltage when indicate lamp lights( please charge if the voltage below 46volts, it will stop working when the magnetic radiator inner battery voltage is 44volts)
- 4.high: low penetrate character, can penetrate <10mm tube wall
- 5.magnetic N & S switch: default value suggested.
- 6.middle: middle penetrate character; can penetrate <20mm tube wall
- 7.low: high penetrate character, can penetrate >20mm tube wall
8. penetrate character adjust area: default value suggested.
- 9.switch of parameter locking & setting status: lamp lights indicates parameter locking status
- 10.magnetic force increasing key
- 11.switch of small or big magnetic force adjustment: lamp lights means small adjusting, default value

suggested.

12. magnetic force decreasing key

13.magnetic force adjusting area

4.4.1.4running of magnetic indicating crawler

Crawler has four kind of running status: stop, go ahead, go back and exposure status.

we can just control stop status into go ahead status;

go ahead status can be controlled into exposure, go back and stop status;

go back status can just controlled into stop status;

Exposure status can step into go ahead status automatically.

Turn power of crawler on, choose the way of magnetic indicating, at this time, crawler has been in stop status (parameters has been setted well), the magnetic radiator point to magnetic receiver, the alarm sounds ,at this time magnetic receiver get the signals to let XO(inside signal) connected(it called magnetic connected), notes connect after over two seconds, the crawler will timer formally.

When crawler is in stop status, after magnetic connect over two seconds, move away magnetic radiator, the crawler will step into go ahead status.

When crawler is in ahead status(the max ahead period is 3min, approx 50m. if over 50m, please control within 45m), after connect over two seconds, it starts timer, during 0 to 10 seconds( crawler alarm continuously) move away the magnetic radiator, crawler will step into exposure status. If during 10 to 20 seconds( crawler alarm one time per seconds) move away the magnetic radiator, crawler will step into back status, If move away the magnetic radiator after 20 seconds, crawler will step into stop status.

When crawler is in back status, after connect over two seconds, move away the magnetic radiator, crawler will step into stop status.

during exposure status, after finish the exposure it will step into ahead status automatically.

During stop status, crawler will alarm one time per 20 seconds, during go ahead status, it will alarm for 2 time as per 20 seconds, during back status, it will alarm for 3 times as per 20 seconds.

No matter what status, XO connect or stop for over 20min, alarm sounds, if over 25min, crawler will go back automatically, so please control it by source per 20min.

4.4.1.5indicating for magnetic indicating crawler:

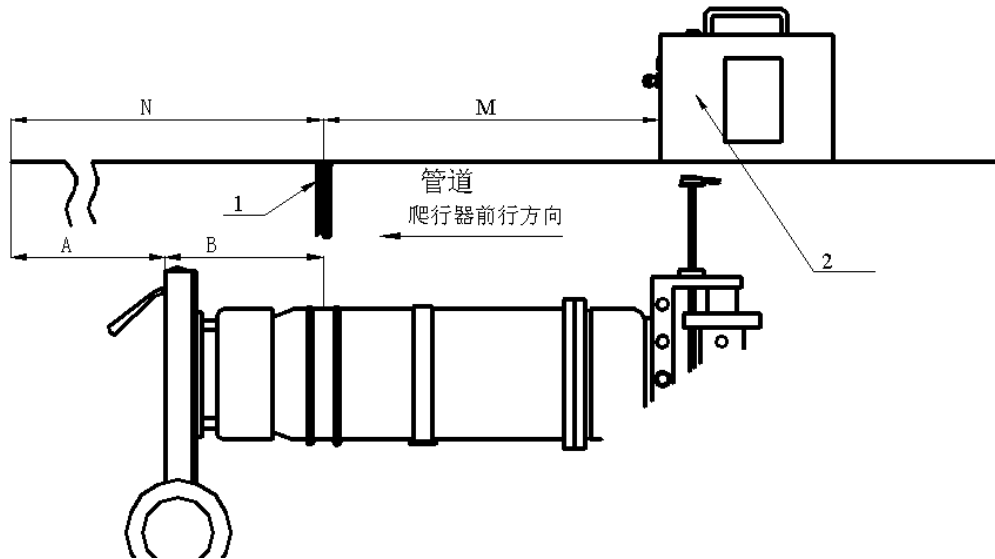


diagram 4

1. Welding: welding which needed to be inspected

2. magnetic radiator: magnetic radiator whose parameter setted well.

M value: distance between welding line and key switch side of magnetic radiator is used for confirming stop exposure, this M value usually be about ; factors influence M value including: pipe wall thickness, pipe diameter, distance between magnetic receiver and pipe wall, magnetic radiator parameter & its position, so that M value is changeable for different pipes, but suggested M value is . there has two ways for confirming M value for one pipe, first is to indicate by suggested M value, film beside the welding line to calculate bias of M value, then confirm the precision M value, it usually need 3or 4 times average value. Second is put the crawler into a short pipe which is same as pipe needed to inspected, regarding one point of crawler head as basic point, confirm another point 0.8m away from pipe side as welding line, and running crawler to calculate A, confirm M by comparing N with A plus B. this method need several experiments to assure its precision.

#### 4.5 Aging of X-ray machine

**Aging X-ray machine according to the aging way of 250KV normally X-ray machine. Especially the usage after long time stay. Aging is very important!!!**

Aging from low to high level, if stay above more than two months, the order is as following: five times for first level, five times for second level, four times for third level ,four times for fourth level, three times for fifth level, three times for sixth level, one minute every time, just age to the voltage which you want is ok, for example, if use 200kv to film just age to 200kv is all right. advise use five level normally.

Staying time under two months, the aging time can reduce accordingly. Do not need to aging if use everyday.

## 5 notices

- During the transmission of crawler should underlay some woods to hang the wheel in the air to avoid the axis curve then influence the indication precision
- During the transmission, the X-ray machine should lay vertical and do some reduce to avoid the X-ray tube shake, and lead to the panoramic density not equality.
- When film in the sixth level, the battery should get enough electricity, when voltage of battery is over low, the X-ray machine will refuse to produce the ray automatically.
- The first time exposure is just read out the time value, and not produce the rays, the destination is to know when is the next time exposure, every time open the power supply switch of the X-ray machine, fist time exposure will not produce ray.
- Low voltage protection. If crawler automatically running reversely in the tube, it means
- The running distance in the manual is tested under the fully charged situation, if the battery didn't charged fully, can not get the technical targets in the manual.
- Must remove the connection cable of X-ray generator before setting the exposure time, then set the exposure parameter, after finish the exposure, connect the cable for avoiding the radiation from the X-ray generator because of misusing.
- Please make sure to charge fully of the battery before using the crawler. Or the system can not work normally because lack of energy.
- The first connect power supply for the crawler should keep over 5 minutes, so that the setting running time and exposure time can keep for seven days.

## 6 maintenance and failure solving

### 6.1 maintenance of crawler

- After using the crawler should charging, especially for long time stay of not using, do charge the battery. group.
- Please replace the battery in some period. (if is using continuously, should replace within 6-8 months a time).

### 6.2 solving of failures:

**6.2.1 pipeline crawler lose of controlling:**

- Crawler running in one direction, at this time no matter how to change the direction operate have no affection. Cause of this phenomenon maybe because the J501 relay on the electric unit driving board has damaged.
- Crawler runs in a opposite direction. Cause of this phenomenon maybe because the battery on the crawler car body is lack of electric quantity, low voltage protection circuit function, this kind of situation belongs normally phenomenon, clients should charges battery on time.
- Low power of Magnetic radiator & wrong position.

**6.2.2 pipeline crawler can not normally exposure. This may be caused by 2 kinds of reasons :**

The battery of crawler is lack of electric quantity so the control unit of X-ray machine refused to exposure.

The damage of X-ray unit controlling part. After confirm the battery of crawler has the full electric quantity, please connect with our company.

**Dan Dong NDT Equipment company**