



LWTX-4503

Metal Abrasive Sensor

user manual

2024 . 2 . 2

Version: v2.0.1

On-Line Oil Metallic Wear Debris Sensor
User Manual and Communication Protocol Manual



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1、Foreword

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The contents of this manual are subject to change without notice. No part of the documentation or software may be reproduced, processed or transmitted electronically in any form without our written permission.

Please read and understand this User's Manual carefully before attempting to install or operate the product associated with this manual or related equipment.

If the equipment is used in a manner or for a purpose different from that described in this manual, the sensor may be damaged.

The end user or integrator ensures the safety of the associated system, hoses or fluid-containing pipework.

Important: This equipment must be installed and operated by qualified personnel.

Important: Unless otherwise stated, all units are in metric system: mm or metres, bar, °C, etc.

All power and oil lines to the sensor must be switched off before new installation or maintenance. The LWTX can be separated from the system by disconnecting the power supply or by closing the oil line valve of the LWTX sensor.

Do not use the LWTX sensor near flammable gases or liquids.

Do not disassemble or repair the LWTX sensor yourself.

Ensure that the oil line pressure is below the maximum limit of the sensor.

Ensure that the supply voltage is within the appropriate specification.

Ensure that the load current does not exceed the rated value.

Ensure that all associated equipment and tubing specifications are in accordance with or greater than the operating specifications of the LWTX, and check that all associated equipment and tubing are properly connected before applying power to the sensor.

Check that all wiring is connected correctly before applying power to the sensor.

Do not weld the sensor to the pipe.

The LWTX sensor must be reliably grounded.

The sensor is pressure tested at the factory, so a small amount of oil may remain inside the sensor, which is normal.



2、Define

Fe	Ferromagnetic metal wear particles
NFe	Non-ferromagnetic metal wear particles
Fe1~8	Iron particle size with filing, default five files, maximum eight files
NFe1~8	Non-ferrous particle sizes with filing, default five grades, maximum of eight grades
FeM	Iron particle mass statistics, updated by time, default 60 seconds, in ug
NFeM	Non-Ferrous Particle Mass Statistics, updated by time, default 60 seconds, units: ug
Feppm	Concentration of iron particles, updated by time, default 60 seconds, in mg/L.
NFeppm	Concentration of non-ferrous particles, updated by time, default 60 seconds, in mg/L
V	Predicted flow velocity in metres per second
PCBT	Sensor internal temperature in °C
TTR	Running time after sensor power-up, in seconds
S16	Signed 16-bit Integer Large End Storage Mode
U16	Unsigned 16-bit Integer Large End Storage Mode
U32	Unsigned 32-bit Integer Large End Storage Mode

lower limit of detection

The smallest particles that can be detected by the sensor: 99.9% pure electrolytic iron, spherical, 40 um diameter, 0.3 m/s flow rate;



Granular statistics and archiving

Fe1	40~100um	The number of iron particles counted in the default five size bands is continuously accumulated and cumulated after power-up, and can be cleared manually;
Fe2	101~200um	
Fe3	201~300um	
Fe4	301~400um	
Fe5	大于 400um	
Fe6	standby	
Fe7	standby	
Fe8	standby	
FeTol	Total iron particles	The number of non-ferrous particles counted in the default five size bands is continuously accumulated and totalised after power-up, and can be cleared manually;
NFe1	150~200um	
NFe2	201~300um	
NFe3	301~400um	
NFe4	401~500um	
NFe5	大于 500um	
NFe6	standby	
NFe7	standby	
NFe8	standby	
NFeTol	Total non-iron particles	

3、introduce



LWTX-4500



LWTX-4503

The LWTX Metal Wear Particle Sensor is a real-time, on-line fluid monitoring sensor designed to monitor the amount of ferromagnetic and non-ferromagnetic metal wear particles in liquid media such as lubricating oils.

By tracking wear particles over time, users can identify component failures at an early stage, thus reducing maintenance and repair costs, minimising downtime, increasing production safety and safeguarding your valuable assets and productivity. The product can be used in a wide range of mechanical equipment platforms such as marine, wind power, hydraulics, transmission and gearboxes.

The LWTX uses the multi-coil electromagnetic induction principle to detect and estimate spherical diameters ranging from 40µm for ferromagnetic metal particles and 150µm for non-ferromagnetic metal particles and above.

The sensor also outputs particle type, number, size, mass, concentration, flow rate, temperature, etc., and can be user-defined with size band filing levels and quantities. The product is compact and robust and can be installed in any lubrication system on any machine. Real-time data on wear particles is transmitted to the user's monitoring system via isolated RS485 MODBUS RTU serial communications, completing the tracking of machinery and equipment status, and allowing the user to make informed maintenance solutions based on real-time data, thus enhancing asset operation and management benefits.

There are two models to choose from, LWTX-4500 oil channel diameter $\Phi 12\text{mm}$, LWTX-4503 oil channel diameter $\Phi 8\text{mm}$, both configured with G1/2' and M14*1.5 female threaded oil interface respectively.

4、 Technical parameter

allowed flow	0.15 ... 2.9m/s ¹⁾
Detection capability	Ferromagnetic abrasive grains Fe > 40µm (ESD) ²⁾
	Non-ferromagnetic abrasive grains NFe > 150µm (ESD)
initial launch	Start-up self-test 30 seconds
Oil line diameter	LWTX-4500: Φ12mm ; LWTX-4503: Φ8mm
digital output	RS485 MODBUS RTU, Isolation voltage 2.5kv
Operating power	DC 9~30V, < 200mA
Probe pressure resistance	10bar Max ³⁾
Applicable fluids	Fluids such as lubricants and hydraulic fluids
fluid temperature	-20 ... 90 °C
environmental temperature	-40 ... 80 °C
Shell material	316 stainless steel, T6061 anodised aluminium
screw interface	LWTX-4500: G1/2" ; LWTX-4503: M14*1.5 ⁴⁾
weight	<2 kg
protection class	IP65
connection cable	LWTX-4500: 2 metres M12--8 core; LWTX-4503: 2 metres M8--6 core
electromagnetic compatibility	EN 61326-1-2-3: 2021

1) The flow velocity has an influence on the signal amplitude. It is recommended that the optimum flow velocity is between 0.3 and 0.5 m/s.

2) ESD: Equivalent Spherical Diameter.

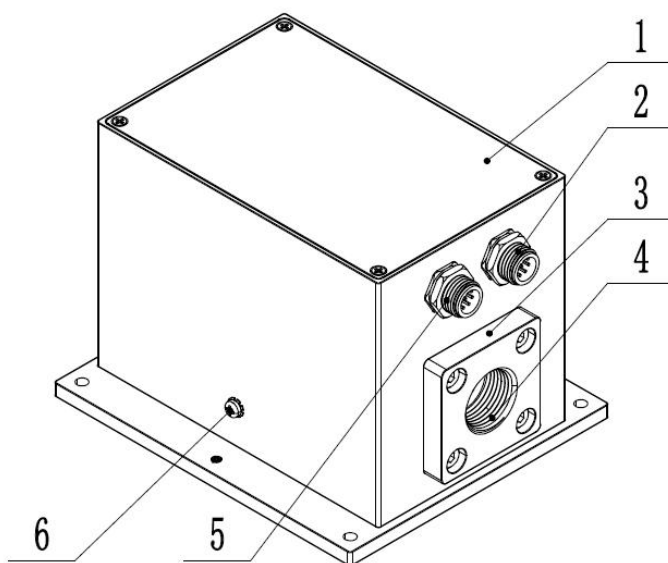
3) For higher pressures, please contact us.

4) Customised versions are available on request.

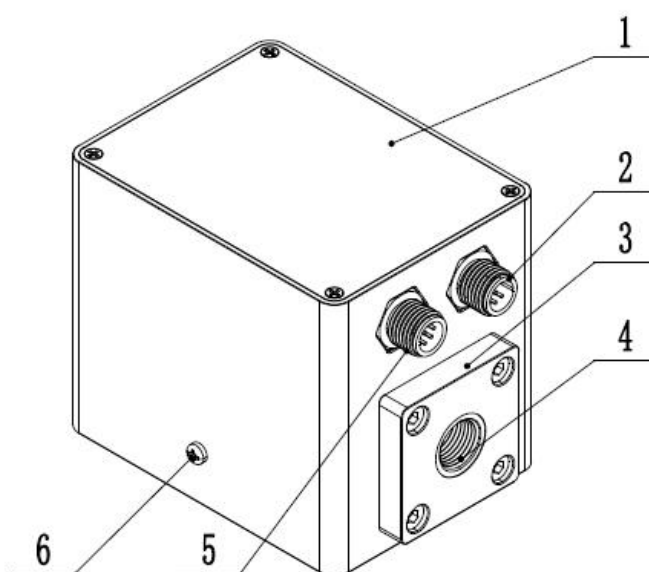
5、Installation & Wiring

1. Sensor Components

The following diagram shows the composition of the LWTX sensor. The sensor is a precision testing instrument, the user can not disassemble the sensor, so as not to cause equipment failure and warranty invalidation.



Schematic diagram of LWTX-4500



Schematic diagram of LWTX-4503



NO.	LWTX-4500	LWTX-4503
1	top plate	top plate
2	M12 8-pole flange block (for mating cable)	M8 6-pole flange holder (for mating cable)
3	Oil line flange	Oil line flange
4	G1/2" female thread	M14*1.5 female thread
5	Commissioning interface (do not wire)	Commissioning interface (do not wire)
6	grounding bolt	grounding bolt

2. Mounting position selection

Proper installation of the LWTX sensor is critical to ensure reliable sensor operation. The following factors should be considered when choosing to determine the best location for the LWTX sensor:

- a) The sensor must be installed in a pipe where the flow rate is within a certain flow rate range.

name	LWTX-4500	LWTX-4503
Permissible flow range (l/min)	1~20	0.2~8.9
Optimum flow range (l/min)	1.5~3	0.9~1.5
Range of permissible flow velocities (m/s)	0.15~2.9	0.15~2.9
Optimum flow velocity range (m/s)	0.3~0.5	0.3~0.5

- b) The sensor must be installed downstream of the gearbox/component to be monitored and before the filter.

- c) There must be no sharp bends in the oil circuit within 30 cm in front of or behind the inlet and outlet of the sensor to avoid the formation of repeated counts of particles in the sensor and the accumulation of particles in the sensor.

- d) Avoid mounting the LWTX on the surface of a high temperature heat source body.

- e) In order to avoid false alarms and to improve the sensitivity of the sensor to small particles, it is recommended that the sensor be mounted as far away as possible from sources of vibration.



3. Sensor oil line interface

The LWTX sensor is equipped with two oil mechanical connections for connection to the system. The connections can be made with the usual hose fittings or tube fittings, and the ends are sealed with O-rings or washi tape.

LWTX-4500 default specification G1/2' female thread, screw depth 12mm;

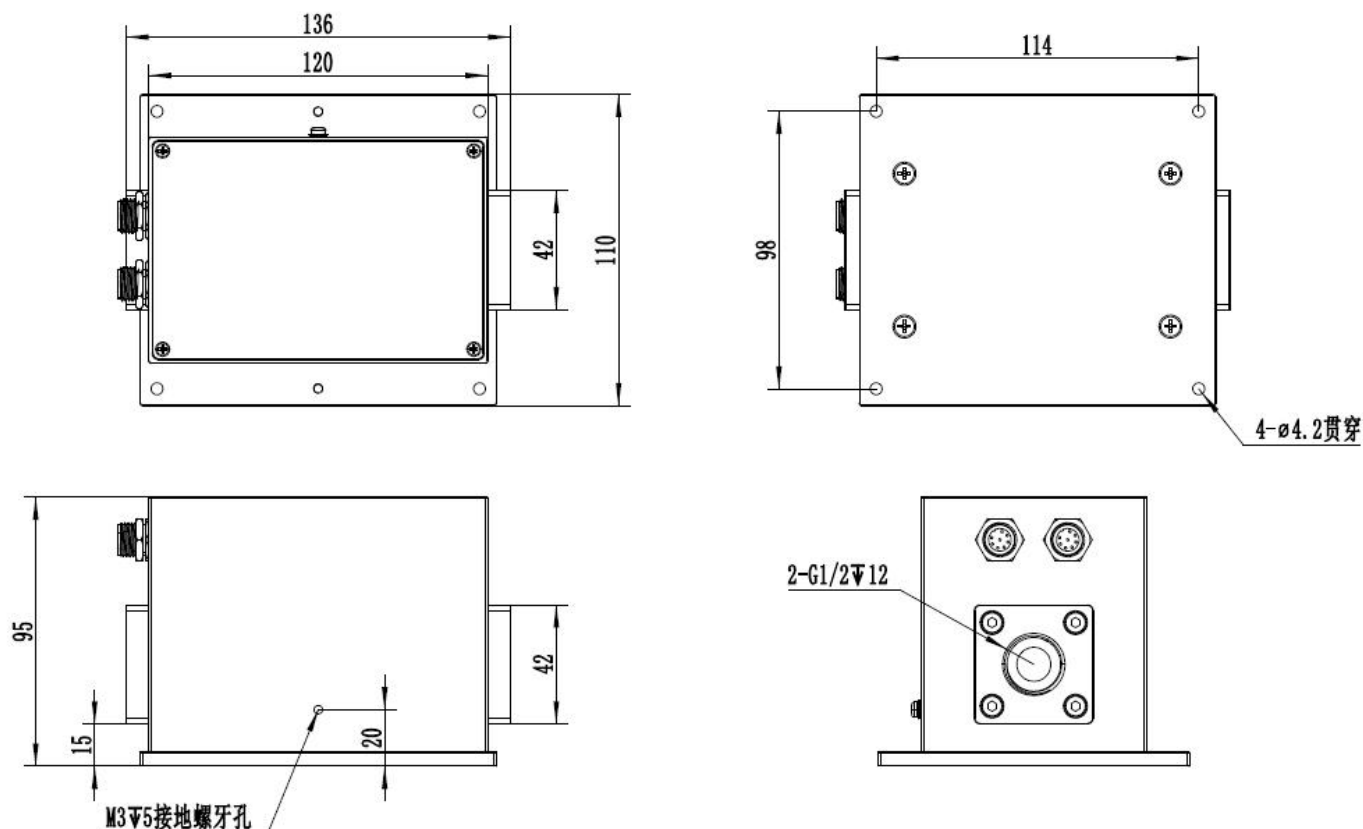
LWTX-4503 default specification M14*1.5 female thread, screw depth 12mm.

note: Sensor oil interface can be customised.

4. Sensor External Dimensions

4.1 LWTX-4500

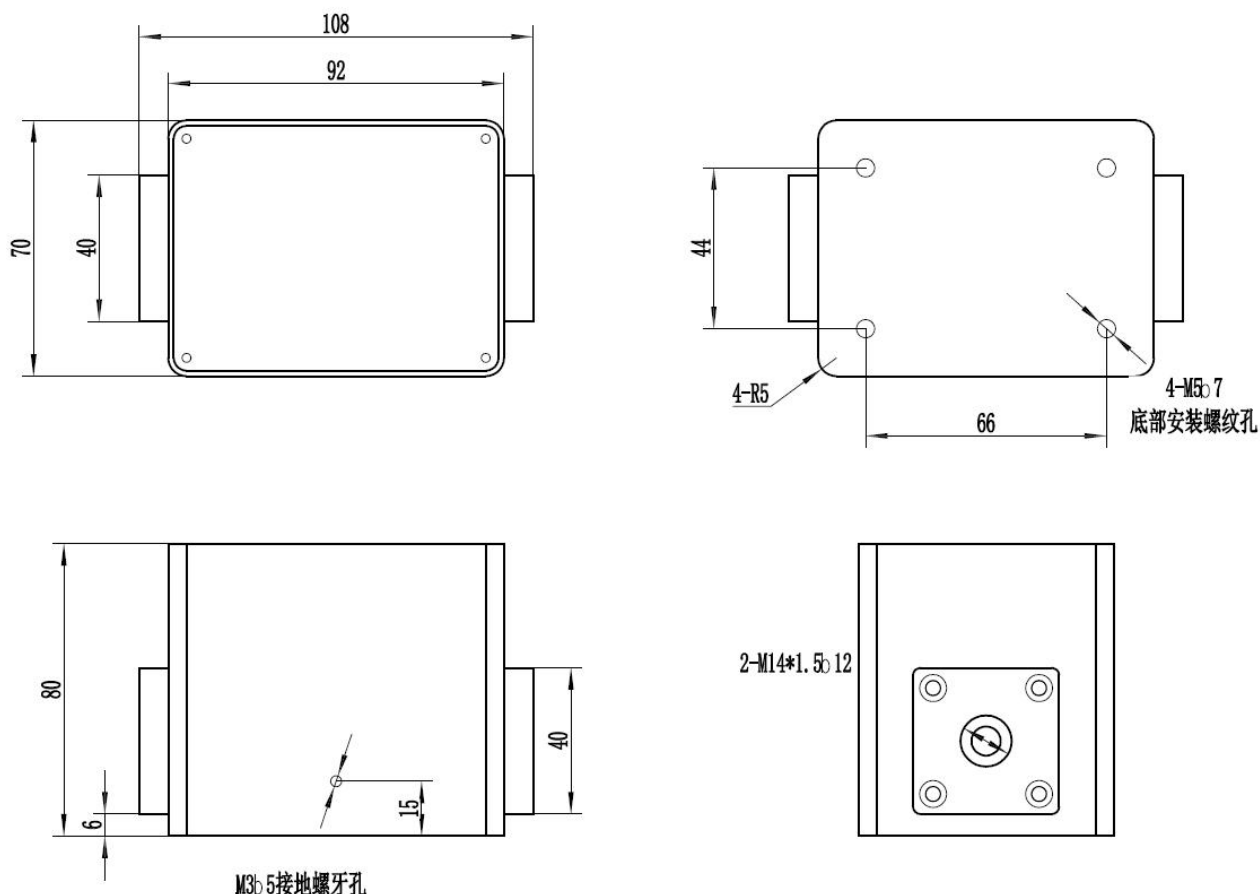
The external dimensions of the sensor are 136mm (L) x 110mm (W) x 95mm (H), and it is fixed by four Φ 4.2mm holes on the bottom cover plate, with the centre distance of the holes being 114mm x 98mm.





4.2 LWTX-4503

The sensor has external dimensions of 108mm (L) x 70mm (W) x 80mm (H) and is secured by four M5 internal screws on the base plate, with holes 66mm x 44mm on centre.



5. The sensor should be installed in such a way that it is easy to observe the sensor's operating status and a certain amount of operating space should be reserved.
6. cables

Before powering on, please carefully check whether the cable wiring is correct, so as to avoid burning the internal devices of the sensor due to wrong wiring.



M12 8-core cable 2 metres straight



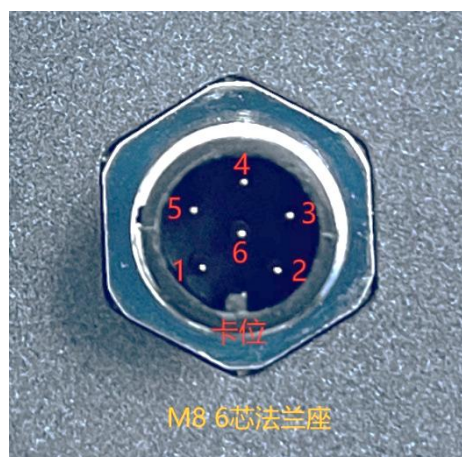
M8 6-core cable 2 metres straight



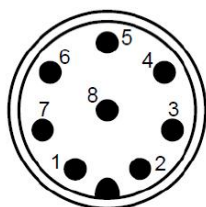
7. Sensor body flange seat

Do not hot-swap the aviation plug with electricity.

Cable connectors have physical limitations, please carefully observe the sensor body flange seat male, and connect the cable female limit, do not misplaced insertion and removal of the sensor cable.

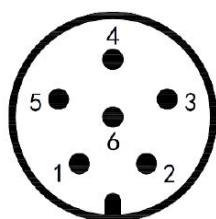


The LWTX-4500 sensor is configured by default with a M12*1.0 connector type airline plug, 2 metre, 8-pole cable, as defined in the figure below:



8)	+24V DC	红色
5)	GND	灰色
1)	RS485+/A	白色
3)	RS485-/B	绿色

The LWTX-4503 sensor is configured by default with a M8*1.0 connector type airline plug with a 2 metre, 6-pole cable, as defined in the figure below:



2)	+24V DC	红色
4)	GND	黑色
1)	RS485+/A	白色
3)	RS485-/B	绿色



8. Oil flow direction

Sensor oil flow direction is not limited, you can choose any direction of oil inlet and outlet.



6、Modbus communication protocol

LWTX sensors provide a standard RS485 communication interface, using MODBUS RTU communication protocol to communicate with the host. In a complete online monitoring system, the master control device acts as the host and the sensors act as the slaves. Each communication handshake is always an access request from the host and a response from the slave. Use specification standard:

‘GB/T19582-2008 Specification for Industrial Automation Network Based on Modbus Protocol’ .

1. data frame format

The format of each byte (frame) sent by the sensor completely follows the MODBUS communication protocol of GB/T19582-2008 standard, and the function code supports reading, writing, batch writing, etc. CRC Checksum: (CRC-16/MODBUS $x16+x15+x2+1$) from the beginning of the ‘address code’ to the end of the ‘data’ . ‘Data’ end. Data frame contains start bit, information bit and stop bit, total 10 bits.

Frame format (10-bit):

start bit	D0	D1	D2	D3	D4	D5	D6	D7	stop bit
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The specific definitions are as follows:

Bit 1: Start bit (‘0’ is valid);

Bits 2 to 9: Information bits;

Bit 10: stop bit (‘1’ valid);

Size: The data frame adopts the order of sending and reading from low to high bit, for multi-byte data, the high byte is transmitted first, followed by the low byte.

For 16-bit or 32-bit binary data, it is divided into two or four data frames and transmitted serially in the order from high byte to low byte.

2. message format

The format of each message received and sent by the sensor is as follows:

——address

——function code

——Amount of data

——Data 1

——...

——Data n

——CRC16 check digit

3. MODBUS Serial port settings

The default settings for serial communication are as follows:

parametric	causality
baud	9600
data bit	8
parity check	none
stop bit	1
Sensor address	1

4. MODBUS function code

The following MODBUS function codes are used to operate the sensor.

function code		clarification
03	0x03	Read Holding Register
04	0x04	Read Input Register
05	0x05	Write Individual Coil Registers
06	0x06	Write Single Holding Register
16	0x10	Write Multiple Holding Registers



5. MODBUS processor register

5.1 Holding register information list

The sensor-related setup parameter information is as follows:

register address	Parameter name	access authority	16-bit word length	data type	range	unit	clarification
1000H	Fe Number of size bands	Read/Write	1	U16	5 ~ 8	bins	Default Value:5
1001H	Fe1 upper point	Read/Write	1	U16		um	Default Value:100
1002H	Fe2 upper point	Read/Write	1	U16		um	Default Value:200
1003H	Fe3 upper point	Read/Write	1	U16		um	Default Value:300
1004H	Fe4 upper point	Read/Write	1	U16		um	Default Value:400
1005H	Fe5 upper point	Read/Write	1	U16		um	Default Value:32767
1006H	Fe6 upper point	Read/Write	1	U16		um	Default Value:32767
1007H	Fe7 upper point	Read/Write	1	U16		um	Default Value:32767
1008H	Fe8 upper point	Read/Write	1	U16		um	Default Value:32767
1009H	NFe Number of size bands	Read/Write	1	U16	5 ~ 8	bins	Default Value:5
100AH	NFe1 upper point	Read/Write	1	U16		um	Default Value:200
100BH	NFe2 upper point	Read/Write	1	U16		um	Default Value:300
100CH	NFe3 upper point	Read/Write	1	U16		um	Default Value:400
100DH	NFe4 upper point	Read/Write	1	U16		um	Default Value:500
100EH	NFe5 upper point	Read/Write	1	U16		um	Default Value:32767
100FH	NFe6 upper point	Read/Write	1	U16		um	Default Value:32767
1010H	NFe7 upper point	Read/Write	1	U16		um	Default Value:32767
1011H	NFe8 upper point	Read/Write	1	U16		um	Default Value:32767
1012H	Mass/concentration update time	Read/Write	1	U16	10 ~ 3600	s	Default Value:60
9000H	device address	Read/Write	1	U16	1 ~ 200		Default Value:1
9001H	baud	Read/Write	1	U16	0 ~ 6	bps	Default Value:2 0 = 2400 1 = 4800 2 = 9600 3 = 19200 4 = 38400 5 = 57600 6 = 115200



5.2 Input register information list

Sensor-related data parameter information is as follows:

register address	Parameter name	access authority	16-bit word length	data type	range	unit	clarification
0010H	Fe1 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	Power-on continuous cumulative power-down loss can be manually cleared.
0012H	Fe2 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
0014H	Fe3 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
0016H	Fe4 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
0018H	Fe5 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
001AH	Fe6 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
001CH	Fe7 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
001EH	Fe8 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
0020H	FeTol total number	read-only	2	U32	0 ~ 4294967295	pcs	Power-on continuous cumulative power-down loss can be manually cleared.
0022H	NFe1 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
0024H	NFe2 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
0026H	NFe3 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
0028H	NFe4 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
002AH	NFe5 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
002CH	NFe6 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
002EH	NFe7 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	
0030H	NFe8 No. of particles	read-only	2	U32	0 ~ 4294967295	pcs	Reading x 0.01 Updated at set time, lost at power down
0032H	NFeTol total number	read-only	2	U32	0 ~ 4294967295	pcs	
0034H	FeM	read-only	2	U32	0 ~ 4294967295	ug	Readings x 0.01 updated at set time, lost at power down
0036H	NFeM	read-only	2	U32	0 ~ 4294967295	ug	
0038H	Feppm	read-only	2	U32	0 ~ 4294967295	mg/L	readings×0.01
003AH	NFeppm	read-only	2	U32	0 ~ 4294967295	mg/L	
003CH	V	read-only	1	U16	0.20 ~ 2.90	m/s	readings×0.01
003DH	PCBT	read-only	1	S16	-40.00 ~ +85.00	°C	readings×0.01
003EH	TTR	read-only	2	U32	0 ~ 4294967295	s	
0061H	Equipment Model	read-only	1	U16			10=LWTX-4500 11=LWTX-4503



0062H	product key	read-only	2	U32			
0064H	hardware version	read-only	2	U32			
0066H	software version	read-only	2	U32			

5.3 Individual Coil Register Information List

The sensor-related operating parameter information is as follows:

register address	Parameter name	access authority	16-bit word length	data type	range	unit	clarification
0001H	Fe/NFe Statistical Zeroing	write	1	U16			Write FF00H Valid
0002H	Restore Factory Settings	write	1	U16			Write FF00H Valid



6. MODBUS register operation

6.1 Read Holding Register

Request:

slave address	function code (0x03)	Register start address high byte (MSB)	Register start address low byte (LSB)	Number of registers high byte (MSB)	Number of registers low byte (LSB)
CRC16 calibration low byte (LSB)	CRC16 calibration high byte (MSB)				

Response:

slave address	function code (0x03)	byte count	First register data high byte (MSB)	First register data low byte (LSB)
...			Last register data high byte (MSB)	Last register data low byte (LSB)
CRC16 calibration low byte (LSB)	CRC16 calibration high byte (MSB)			

Example: To read the number of Fe and NFe dimensional bands and the endpoints on each band (sensor address 1, number of Fe bands 6, endpoints on each band 100um, 200um, 300um, 400um, 500um; number of NFe bands 4, endpoints on each band 200um, 400um, 600um).

Fe size tape	NFe size tape
0 – 100	0 – 200
101 – 200	201 – 400
201 – 300	401 – 600
301 – 400	> 600
401 – 500	
> 500	

sending	01 03 10 00 00 12 C1 07
reception	01 03 24 00 06 00 64 00 C8 01 2C 01 90 01 F4 7F FF 7F FF 7F FF



	00 04 00 C8 01 90 02 58 7F FF 7F FF 7F FF 7F FF 7F FF
	8B 20

6.2 Write Single Holding Register

Request:

slave address	function code (0x06)	Register start address high byte (MSB)	Register start address low byte (LSB)	Data High Byte (MSB)	Data Low Byte (LSB)
CRC16 calibration low byte (LSB)	CRC16 calibration high byte (MSB)				

Response:

slave address	function code (0x06)	Register start address high byte (MSB)	Register start address low byte (LSB)	Data High Byte (MSB)	Data Low Byte (LSB)
CRC16 calibration low byte (LSB)	CRC16 calibration high byte (MSB)				

Example: To set the sensor address (sensor address changed from 1 to 2).

sending	01 06 90 00 00 02 25 0B
reception	01 06 90 00 00 02 25 0B



6.3 Write Multiple Holding Registers

Request:

slave address	function code (0x10)	Register start address high byte (MSB)	Register start address low byte (LSB)	Number of registers high byte (MSB)	Number of registers low byte (LSB)
byte count	First data high byte (MSB)	First data low byte (LSB)	...	Last data high byte (MSB)	Last data low byte (LSB)
CRC16 calibration low byte (LSB)	CRC16 calibration high byte (MSB)				

Response:

slave address	function code (0x10)	Register start address high byte (MSB)	Register start address low byte (LSB)	Number of registers high byte (MSB)	Number of registers low byte (LSB)
CRC16 calibration low byte (LSB)	CRC16 calibration high byte (MSB)				

Example: To set the number of Fe and NFe dimensional bands and the endpoint values for each band (sensor address 1, number of Fe bands 5, endpoint values for each band 125um, 250um, 375um, 500um; number of NFe bands 5, endpoint values for each band 175um, 275um, 375um, 600um).

Fe size tape	NFe size tape
0 – 125	0 – 175
126 – 250	176 – 275
251 – 375	276 – 375
376 – 500	376 – 600
> 500	> 600

sending	01 10 10 00 00 12 24 00 05 00 7D 00 FA 01 77 01 F4 7F FF 7F FF 7F FF 7F FF 00 05 00 AF 01 13 01 77 02 58 7F FF 7F FF 7F FF 7F FF 3D B8
reception	01 10 10 00 00 12 44 C4



6.4 Read Input Register

Request:

slave address	function code (0x04)	Register start address high byte (MSB)	Register start address low byte (LSB)	Number of registers high byte (MSB)	Number of registers low byte (LSB)
CRC16 calibration low byte (LSB)	CRC16 calibration high byte (MSB)				

Response:

slave address	function code (0x04)	byte count	First data high byte (MSB)	First data low byte (LSB)	...
...	...	Last data high byte (MSB)	Last data low byte (LSB)	CRC16 calibration low byte (LSB)	CRC16 calibration high byte (MSB)

Example 1: Read the number of particles in each size band and the total number of particles for Fe and NFe (Sensor Address 1, Fe1 particles 4, Fe2 particles 8, Fe3 particles 24, Fe4 particles 4, Fe5 particles 0, total FeTol 40; NFe1 particles 3, NFe2 particles 18, NFe3 particles 6):: NFe4 particles 11, NFe5 particles 10, total NFeTol 48). The number of NFe1 particles is 3, the number of NFe2 particles is 18, the number of NFe3 particles is 6, the number of NFe4 particles is 11, the number of NFe5 particles is 10, and the total number of NFeTol is 48.)

Fe size tape	quantities	NFe size tape	quantities
0 – 125	4	0 – 175	3
126 – 250	8	176 – 275	18
251 – 375	24	276 – 375	6
376 – 500	4	376 – 600	11
> 500	0	> 600	10
total	40	total	48

sending	01 04 00 10 00 24 F1 D4
reception	01 04 48 00 00 00 04 00 00 00 08 00 00 00 18 00 00 00 04 00 28 00 00 00 03 00 00 00 12 00 00 00 06 00 00 00 0B 00 00 00 0A 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 30



EE 4B

Example 2: Reading the mass and concentration of ferromagnetic and non-ferromagnetic particles (sensor address 1, FeM 4762.42 ug, NFeM 1890.56 ug; Feppm 1.05 mg/L, NFeppm 0.42 mg/L).

Indicator name	Fe	NFe
quality (ug)	4762.42	1890.56
concentration (mg/L)	1.05	0.42

Note: Mass and Concentration refers to the statistics within the last setting update time, in this case 60 seconds.

sending	01 04 00 34 00 08 B0 02
reception	01 04 10 00 07 44 52 00 02 E2 80 00 00 00 69 00 00 00 2A 83 4C

6.5 Write Individual Coil Registers

Request:

slave address	function code (0x04)	Output Address High Byte (MSB)	Output Address Low Byte (LSB)	Output value high byte (MSB)	Output Value Low Byte (LSB)
CRC16 calibration low byte (LSB)	CRC16 calibration high byte (MSB)				

Response:

slave address	function code (0x04)	Output Address High Byte (MSB)	Output Address Low Byte (LSB)	Output value high byte (MSB)	Output Value Low Byte (LSB)
CRC16 calibration low byte (LSB)	CRC16 calibration high byte (MSB)				



Example: Zeroing the number of ferrous/non-ferromagnetic particles (sensor address 1).

sending	01 05 00 01 FF 00 DD FA
reception	01 05 00 01 FF 00 DD FA

7、safeguard

cleanse

The sensor housing does not need to be cleaned during normal use. If it does need to be cleaned, simply wipe it with a soft cloth or paper towel. If the internal oil vent line is clogged, it should be cleaned using conventional methods. Do not use corrosive chemicals or mechanical methods such as wire brushes or scrapers to remove blockages in the LWTX bore as this may scratch and damage the internal pipework.

Calibration and Service

The LWTX uses proven, patented multi-coil inductive measurement technology combined with an in-house precision data sampling and processing assembly to complete online monitoring and trending of metal wear particles. There are no moving parts or other consumable components inside the sensor, resulting in high reliability and long-term stability.

To maintain reliable performance, it is recommended that the LWTX sensor be serviced, inspected and calibrated every two years.

Technical Support

If you have any questions, please contact us:

ShangHai LUWATECH Industrial Co.,Ltd.

Address: 2F, South Gate, Building 5, No. 333 Kangqiao East Road,

Pudong New Area, Shanghai

TEL: 139173371469 (VX) 021-58073569

E-mail: maorong.long@luowansy.com

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<http://www.luwatech.com.cn>

Particle Counter Specialist Supplier