English

Operating and Assembly Instructions

Optical fibre transmission system for incremental encoder signals

LWL – Transmitter **Type: FO-TX-1**
LWL – Decoder **Type: FO-DX-1**
Type: FO-DX-1i

Read the Operating and Assembly Instructions prior to assembly, starting installation and handling!
Keep for future reference!

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Contents

1 General

1.1 Information about the Operating and Assembly Instructions

These operating and assembly instructions provide important instructions for working with the transmission system. They must be carefully read prior to starting all tasks, and the instructions contained herein must be followed.

In addition, applicable local regulations for the prevention of industrial accidents and general safety regulations must be complied with.

1.2 Scope of supply

The scope of supply of the transmission system includes the transmission system and the operating and assembly instructions.

1.3 Explanation of symbols

Warnings are indicated by symbols in these operating and assembly instructions. The warnings are introduced by signal words that express the scope of the hazard. To prevent accidents, personal injuries and material damage it is imperative to observe the information provided and proceed with due care and attention at all times.

WARNING!
Indicates a possibly dangerous situation that can result in death or serious injury if it is not avoided.

CAUTION!
Indicates a possibly dangerous situation that can result in minor injury if it is not avoided.

!

CAUTION!
Indicates a possibly dangerous situation that can result in material damage if it is not avoided.

NOTES!
Indicates useful tips and recommendations as well as information for efficient and trouble-free operation.

DANGER!
Life-threatening danger due to electric shock!
Indicates a life-threatening situation due to electric shock. If the safety instructions are not complied with there is danger of serious injury or death. The work that must be executed should only be performed by a qualified electrician.

1.4 Warranty and liability

In principle the "General Terms and Conditions" of Johannes Hübner Fabrik elektrischer Maschinen GmbH apply. These are available to the operator with the Order Confirmation or when the contract is concluded at the latest. Warranty and liability claims in the case of personal injury or damage to property are excluded, as well as the operating license expires if they result from one or more of the following causes:

- Non-observance of the operating and assembly instructions.
- Non-intended use of the transmission system.
- Improper assembly, installation and start-up of the transmission system.
- Operation of the transmission system with technical defects.
- Mechanical or electrical modifications to the transmission system undertaken autonomously.
- Repairs carried out autonomously.
- Third party interference and Acts of God
- Deployment of non-qualified personnel.
- Opening of the transmission system.

1.5 Organizational measures

- The operating and assembly instructions must always be kept ready-to-hand at the place of use of the transmission system.
- In addition to the operating and assembly instructions, generally valid legal and other binding regulations on accident prevention and environmental protection must be observed and communicated.
- The respective applicable national, local and system-specific provisions and requirements must be observed and communicated.
- The operator is obliged to inform personnel on special operating features and requirements.
- The nameplate and any prohibition or instruction symbols applied on the transmission system must always be maintained in a legible state.
- Repairs may only be undertaken by the manufacturer or a center or person authorized by the manufacturer.

1.6 Copyright

NOTES!

Content information, text, drawings, graphics, and other representations are protected by copyright and are subject to commercial property rights.

It is strictly forbidden to make copies of any kind or by any means for any purpose other than in conjunction with using the device without the prior written agreement of the manufacturer. Any copyright infringements will be prosecuted.

1.7 Guarantee terms

The guarantee terms are provided in the manufacturer´s terms and conditions.

1.8 Customer service

For technical information personnel is available that can be reached per telephone, fax or email. See manufacturer´s address on page 2.

2 Basic safety instructions

DANGER!

This section provides an overview of all the important safety aspects that ensure protection of personnel, as well as safe and trouble-free device operation.

If these safety instructions are not complied with significant hazard can occur.

2.1 Responsibility of the owner

The transmission system is used in the commercial sector. The operator of the transmission system is therefore subject to the legal obligations for occupational safety as well as the safety, accident prevention and environmental regulations applicable to the area of application of the function modules.

2.2 Personnel selection and qualification; basic obligations

- Qualified personnel must only carry out all work on the transmission system. Qualified personnel includes persons, who, through their training, experience and instruction, as well as their knowledge of the relevant standards, provisions, accident prevention regulations and operating conditions, have been authorized by the persons responsible for the system to carry out the required work and are able to recognize and avoid potential hazards. They are capable of identifying and avoiding potential hazards.
- The definition of “qualified personnel” also includes an understanding of the standards VDE 0105-100 and IEC 364 (source: e.g. Beuth Verlag GmbH, VDE-Verlag GmbH).
- The responsibility for assembly, installation, commissioning and operation must be clearly defined. The obligation exists to provide supervision for trainee personnel.

2.3 Intended use

System for interference-free transmission of electrical incremental encoder and SSI absolute encoder signals via optical fibre.

The electrical encoder signals are converted into optical signals and transmitted interference-free via one common optical fibre.

The decoder converts the optical signals back into electrical signals and makes them available to the controller.

The system manufacturer must check that the characteristics of the transmission system satisfy his application-specific safety requirements. The responsibility or decision regarding the use of the transmission system lies with the system manufacturer. The transmission system is designed for unattended continuous operation.

For UL and CSA: For the use in NFPA 79 applications only.

Intended use also includes:

- observing all instructions in this operating and assembly instructions
- observing the nameplate and any prohibition or instruction symbols on the transmission system
- observing the operating instructions from the machine/system manufacturer
- operating the transmission system within the limit values specified in the technical data
- Omission of a non-intended use

2.4 Non-intended use

WARNING!

Danger of death, physical injury and damage to property in case of non-intended use of the transmission system!

The following areas of use are especially forbidden:

- in environments where there is an explosive atmosphere.
- use in environments with radioactive radiation.
- use on ships.
- for medical purposes.

2.5 Safety information

WARNING! NOTICE! NOTES!

Destruction, damage and malfunction of the transmission system!

- Only carry out wiring work or opening and closing of electrical connections with the system de-energized.
- Potential hazards resulting from interactions with other systems and equipment which are or will be installed in the vicinity must be checked. The user is responsible for taking appropriate measures.
- The power supply must be protected with a fuse suitable for the supply lead cross-section.
- Cables used must be suitable for the temperature range.
- A defective transmission system must not be operated.
- Opening the transmission system is forbidden.
- The type plate specifies the technical characteristics of the transmission system. If the type plate is no longer legible or if the type plate is completely missing, the transmission system must not be operated. Contact Hübner Service (see page 2).

NOTES!

Disposal

If disposal has to be undertaken after the lifespan of the transmission system, the respective applicable country-specific regulations are to be observed.

3 Assembly

3.1 Safety instructions

WARNING!

- At assembly, dismantling and other work to the device the basic safety instructions to chapter 2 must be observed.
- In general, the requirements and acceptance conditions of the entire plant must be taken into account for the cultivation..

The 25mm x 122mm x 117 mm size module can be snapped onto standard mounting rails.

3.2 Basic rules

WARNING!

- Separate laying of power and signal cables.
- Observe the manufacturer's instructions when installing inverters, shield the power cables between the frequency inverter and the motor.
- Sufficient dimensioning of the power supply.

3.3 Replacing the transmission system

The following points must be noted when replacing the transmission system:

- The new transmission system must have the same order number (ID) as the transmission system being replaced.
- When recommissioning the replaced transmission system, correct functioning must be ensured first of all by means of a protected test run.

4 Technical data

4.1 Type plate

The figure below shows an example of a type plate.

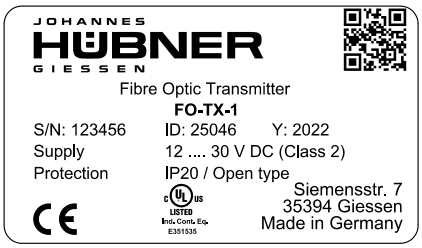


Fig. 4-1: Type plate (Example)

The type plate and UKCA label are located on the side of the housing.

Type plate information:

- Manufacturer
- Type, Date of manufacturing (Year)
- CE- mark
- Serialnumber (S/N)
- Degree of protection (IP)
- Supply voltage
- Order number (ID)
- QR-code

4.2 General description:

The electrical encoder signals are converted into optical signals and transmitted interference-free via one common optical fiber.
The decoder converts the optical signals back into electrical signals.
In the FO-DX-1i variant, the second output block can be galvanically isolated from the first output block by applying two galvanically isolated supply voltages.
Both output blocks can be set separately to output HTL or TTL signals. The setting is made at the factory.
The maximum signal frequency can be up to 1 MHz for RS422 encoder signals.
For HTL encoder signals the maximum signal frequency is 400 kHz. The signal processing time, measured from transmitter input to decoder output is approx. 1 µs.
For each 100 m fiber optic length, an additional signal propagation time of approx. 500 ns must be expected.
The signal jitter caused by the serial data transmission is max. 15 ns
For convenient commissioning or fault location, direction of rotation and status signals are displayed on front panel LEDs.
In addition, the fiber optic receive power is displayed on the decoder.
In case of a fiber optic interruption, the signal output stages are switched to high impedance and enable a connected PLC to detect the error.

4.3 Electrical and mechanical data transmitter FO-TX-1

Design	Flat module, mounted in plastic housing (PHOENIX CONTACT ®)
Dimensions	w = 25 mm x h = 122 mm x d = 117 mm
Connectors for electrical signals	Pluggable screw terminals (tightening torque 0,5 Nm…0,6 Nm) Connection diagram PN216-410
Connectors for FOC	ST®-plug
Supply voltage	12…30 VDC. For UL and CSA Class 2 supplied
Power consumption	max. 5 W
Surrounding Air temperature	-20°C … +70°C
Incremental encoder interface	
Electrical inputs	Signal channel 0°, 90°, N, STATUS each with inverted signal
Signal level	configurable via DIP-Switches - HTL differential - HTL single-ended - RS 422 - TTL single-ended
max. frequency	400 kHz 1 MHz for RS 422
Signal jitter	≤ 15 ns
Fiber optic	
type	Multimode gradient index fiber 50/125 µm or 62,5/125 µm
max. length	1000 m between transmitter and encoder
Signal processing time	approx. 1 µs measured from transmitter input to decoder output
Signal runtime	approx. 500 ns each 100 m fiber optic cable length

4.4 Electrical and mechanical data decoder

NOTES for UL and CSA!
Do only use copper cables

FO-DX-1	
Design	Flat module, mounted in plastic housing (PHOENIX CONTACT®)
Dimensions	w = 25 mm x h = 122 mm x d = 117 mm
Connectors for electrical signals	Pluggable screw terminals (tightening torque 0,5 Nm…0,6 Nm)
Connectors for FOC	ST®-plug
Supply voltage	12…30 VDC. For UL and CSA Class 2 supplied
Power consumption	max. 5 W
Surrounding Air temperature	-20°C … +70°C
Incremental encoder interface	
Electrical outputs	Signal channel 0°, 90°, N, STATUS each with inverted signal
Signal level	HTL differential, connection diagram PN216-411
Signal level	HTL/TTL, connection diagram PN216-412
Signal level	TTL, RS 422, connection diagram PN216-413
Fiber optic	
type	Multimode gradient index fiber 50/125 µm or 62,5/125 µm
max. length	1000 m between transmitter and decoder

FO-DX-1i	
Design	Flat module, mounted in plastic housing (PHOENIX CONTACT®)
Dimensions	w = 25 mm x h = 122 mm x d = 117 mm
Connectors for electrical signals	Pluggable screw terminals (tightening torque 0,5 Nm…0,6 Nm)
Connectors for FOC	ST®-plug
Supply voltage 1	12…30 VDC. For UL and CSA Class 2 supplied
Supply voltage 2	12…30 VDC. For UL and CSA Class 2 supplied
Power consumption	max. 5 W
Surrounding Air temperature	-20°C … +70°C
Incremental encoder interface	
Electrical outputs	Signal channel 0°, 90°, N, STATUS each with inverted signal
Signal level	HTL differential, connection diagram PN216-414
Signal level	HTL/TTL, connection diagram PN216-415
Signal level	TTL, RS 422, connection diagram PN216-416
type	Multimode gradient index fiber 50/125 µm or 62,5/125 µm
max. length	1000 m between transmitter and decoder

4.5 Connection diagram transmitter FO-TX-1

1	+12…30V	INPUT	Supply voltage
2	0V (GND)	INPUT	Ground
11	n.c.	-	not connected
12	n.c.	-	not connected
Incremental-Encoder-Interface (see encoder interface-configuration)			
3	0°	INPUT	Signal channel 0°
4	/0° GND	INPUT	Signal channel 0° inverted/GND
5	90°	INPUT	Signal channel 90°
6	/90° GND	INPUT	Signal channel 90° inverted/GND
7	N	INPUT	Marker pulse signal
8	/N GND	INPUT	Marker pulse signal inverted/GND
9	STATUS	INPUT	STATUS signal
10	/STATUS	INPUT	STATUS signal inverted/GND

DIP Switch	**Encoder interface configuration**			
	D-HTL differential HTL 12…30V	RS422	S-HTL single-ended 12…30V	S-TTL single-ended TTL 5…12V
	0° /0°	0° /0°	0° GND	0° GND
	90° /90°	90° /90°	90° GND	90° GND
	N /N	N /N	N GND	N GND
1	ON	OFF	ON	OFF
2	ON	OFF	OFF	ON

3	Not connected	

	FO-LED-Power	
4	OFF (default) FO cable length < 500 meters	ON (high) FO cable length > 500 meters

4.6 Connection diagram decoder

FO-DX-1

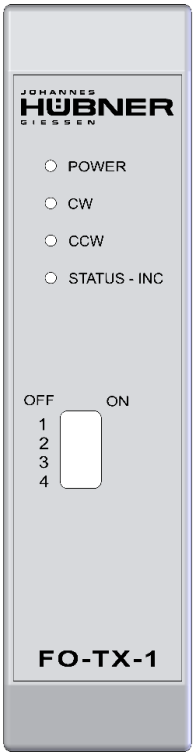
1	+12…30V	INPUT	Supply voltage
2	0V (GND)	INPUT	Ground
11	n.c.	-	not connected
12	n.c.	-	not connected
Interface Incremental encoder interface output block 1			
3	0°	OUTPUT	Signal channel 0°
4	/0°	OUTPUT	Signal channel 0° inverted
5	90°	OUTPUT	Signal channel 90°
6	/90°	OUTPUT	Signal channel 90° inverted
7	N	OUTPUT	Marker pulse signal
8	/N	OUTPUT	Marker pulse signal, inverted
9	STATUS	OUTPUT	STATUS signal
10	/STATUS	OUTPUT	STATUS signal inverted
Interface Incremental encoder interface output block 2			
13	0°	OUTPUT	Signal channel 0°
14	/0°	OUTPUT	Signal channel 0° inverted
15	90°	OUTPUT	Signal channel 90°
16	/90°	OUTPUT	Signal channel 90° inverted
17	N	OUTPUT	Marker pulse signal
18	/N	OUTPUT	Marker pulse signal, inverted
19	STATUS	OUTPUT	STATUS signal
20	/STATUS	OUTPUT	STATUS signal inverted

FO-DX-1i

1	+12…30V	INPUT	Supply voltage 1
2	0V (GND)	INPUT	Ground
11	+12…30V	INPUT	Supply voltage 2
12	0V (GND)	INPUT	Ground
Interface Incremental encoder interface output block 1			
3	0°	OUTPUT	Signal channel 0°
4	/0°	OUTPUT	Signal channel 0° inverted
5	90°	OUTPUT	Signal channel 90°
6	/90°	OUTPUT	Signal channel 90° inverted
7	N	OUTPUT	Marker pulse signal
8	/N	OUTPUT	Marker pulse signal, inverted
9	STATUS	OUTPUT	STATUS signal
10	/STATUS	OUTPUT	STATUS signal inverted
Interface Incremental encoder interface output block 2			
13	0°	OUTPUT	Signal channel 0°
14	/0°	OUTPUT	Signal channel 0° inverted
15	90°	OUTPUT	Signal channel 90°
16	/90°	OUTPUT	Signal channel 90° inverted
17	N	OUTPUT	Marker pulse signal
18	/N	OUTPUT	Marker pulse signal, inverted
19	STATUS	OUTPUT	STATUS signal
20	/STATUS	OUTPUT	STATUS signal inverted

4.7 Operating states and displays FO-TX-1

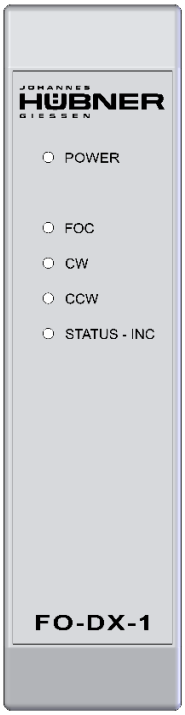
LED	Display	Operating status
POWER	green	Operating voltage applied
	off	Operating voltage missing or wrong polarity
CW CCW	off off	Encoder standstill
CW CCW	green off	Clockwise direction of rotation
CW CCW	off green	Counterclockwise direction of rotation
CW	red	Signal channel 0°, connection error or missing sensor supply
CCW	red	Signal channel 90°, connection error or missing sensor supply
STATUS-INC	green	High signal at signal input STATUS
	off	Low signal at signal input STATUS



4.8 Operating states and displays

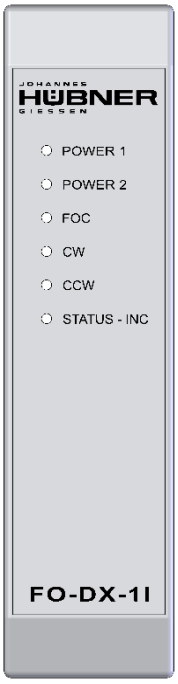
FO-DX-1

LED	Display	Operating status
POWER	green	Operating voltage applied
	off	Operating voltage missing or wrong polarity
FOC	green	Signal reception
	orange	Signal reception no longer secure
	red	No signal reception
CW CCW	off off	Encoder standstill
CW CCW	green off	Clockwise direction of rotation
CW CCW	off green	Counterclockwise direction of rotation
STATUS-INC	green	High signal at signal input STATUS
	off	Low signal at signal input STATUS



FO-DX-1i

LED	Display	Operating status
POWER 1	green	Operating voltage 1 applied
	off	Operating voltage 1 missing or wrong polarity
POWER 2	green	Operating voltage 2 applied
	off	Operating voltage 2 missing or wrong polarity
FOC	green	Signal reception
	orange	Signal reception no longer secure
	red	No signal reception
CW CCW	off off	Encoder standstill
CW CCW	green off	Clockwise direction of rotation
CW CCW	off green	Counterclockwise direction of rotation
STATUS-INC	green	High signal at signal input STATUS
	off	Low signal at signal input STATUS



5 Transport, packaging and storage

5.1 Safety information concerning transport

!	**CAUTION!** **Material damage caused by improper transport!** Observe the symbols and information on the packaging: Do not throw - risk of breakage. Keep dry

5.2 Goods inward inspection

Check the delivery immediately upon receipt for transit damage or short delivery. Inform the carrier immediately on receipt if you determine that damage has occurred during transit (take photos as proof).

5.3 Packaging (disposal)

The packaging is not taken back; dispose of according to the respective valid statutory provisions and local regulations.

5.4 Storing packages (devices)

	**Keep dry!** Keep packages dry and free from dust; protect from moisture.

If you intend to store the device for a longer period of time (> 6 months) we recommend you use protective packaging (with desiccant).

5.5 Returning devices (repairs/goodwill/warranty)

The devices which have got into contact with radioactive radiation or radioactive materials will not be taken back.
The devices which have got into contact with possibly noxious chemical or biological substances must be decontaminated before the return.
They must also be accompanied by a safety clearance certificate.

5.6 Disposal

The manufacturer is not obliged to take back the goods.
The transmission system must be treated as special electronic waste and disposed of in accordance with the laws of the country in question.
The local authorities or special waste management companies will provide information on environmentally friendly disposal.