Manual

ETM Solo, weft tension monitor

Document ID:	TH-0292-05
Document	TH-0292-05 Manual ETM Solo.docx
Date:	2021-10-14

CONTENTS

1   INTRODUCTION

This document describes the ETM-Solo sensor.

2.   Description

2.1. General

The ETM-Solo sensor is a tension measuring device. The range is 0-1000 cN or 0-2500 cN . It can be controlled over the CAN bus and the tension values can be taken from the CAN bus or an analog output.

Models with Yarn movement signal output have a separate output to indicate the movement of the yarn.

2.2. Table of models

2.2.1. Current models.

Eltex part no	Tension range	CAN	Analog output	Other characteristics
56004	1000 cN	500 kbit/s	M8 connector	
56005	1000 cN	1 Mbit/s	M8 connector	Yarn movement signal output
56006	1000 cN	1 Mbit/s		
56008	1000 cN	500 kbit/s	M8 connector	Yarn movement signal output
56074	2500 cN	500 kbit/s	M8 connector	Coarse yarn model
56075	2500 cN	1 Mbit/s	M8 connector	Coarse yarn model
56077	2500 cN	1 Mbit/s	M8 connector	Yarn movement signal output Coarse yarn model
56078	2500 cN	500 kbit/s	M8 connector	Yarn movement signal output. Coarse yarn model
56079	2500 cN	1 Mbit/s		

2.2.2. Previous models.

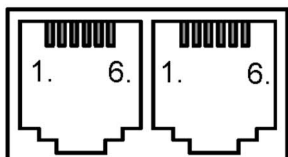| Eltex part no	Tension range	CAN	Analog output	Other characteristics
56000	1000 cN	500 kbit/s	2,5 mm Stereo	
56001	1000 cN	1 Mbit/s	2,5 mm Stereo	
56002	1000 cN	-	2,5 mm Stereo	
56003	1000 cN	1 Mbit/s	M8 connector	Yarn movement signal output Replaced by 56005
56007	1000 cN	1 Mbit/s		Replaced by 56006
56070	1000 cN	-	2,5 mm Stereo	Protective lacquer
56071	2500 cN	500 kbit/s	2,5 mm Stereo	
56072	2500 cN	1 Mbit/s	2,5 mm Stereo	
56073	1000 cN	500 kbit/s	2,5 mm Stereo	Coarse yarn model
56076	2500 cN	1 Mbit/s	M8 connector	Yarn movement signal output. Coarse yarn model. Replaced by 56077

2.2.3. Common features.

Supply Voltage	10-26 V DC
Maximum current consumption	80 mA
Resolution	< 1cN
Accuracy	±1,8% of full range
Band width	1 kHz
Ambient working temperature	+10 – 40°C
Dimensions	95 x 73 x 20 mm

2.3. Installation

A maximum of 16 sensors can be connected together. A normal 6 lead modular cable with 6P6C connectors can be used to connect the sensors to each other and to the host.
The two inputs to the sensor are identical so either one can be used to connect to next sensor.

The first sensor must have its pin 5 shortened to ground in the input connected to host. This will give the first sensor CAN address 1. The sensor connected to this one will get the CAN address 2 and so on. The addresses are used when answering certain CAN commands.
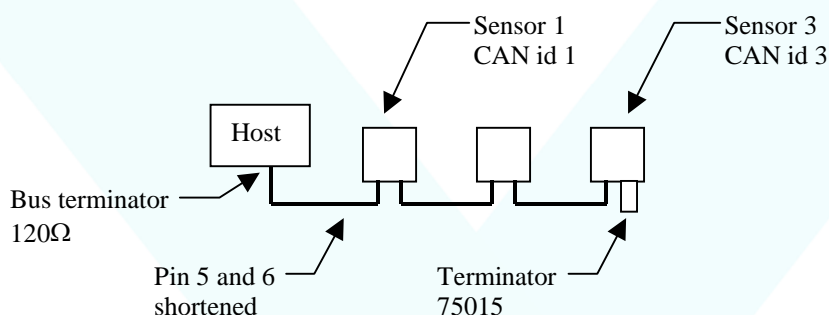
Modular 6P6C

1. Power supply 17-26V DC
2. Sync in 4.5-30V DC
3. CANH
4. CANL
5. Daisy signal
6. GND

The last sensor will only have a cable connected to one input. The other input must have a termination plug 75015.
Host must also terminate the CAN-bus with a 120 ohm resistor between 3 CANH and 4 CANL.
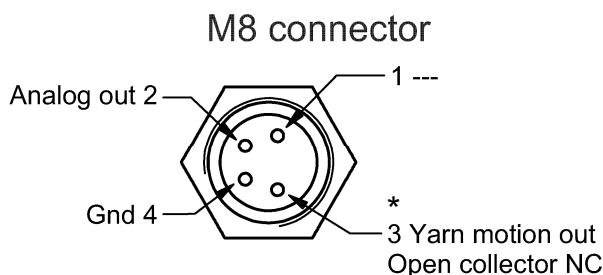Pin 2, sync input, is not used.

If only the analog output shall be used on units with CAN, then the host with its bus terminator can be omitted. Terminator 75015 should still be mounted and pin 5 and 6 shortened to avoid error and address indication.
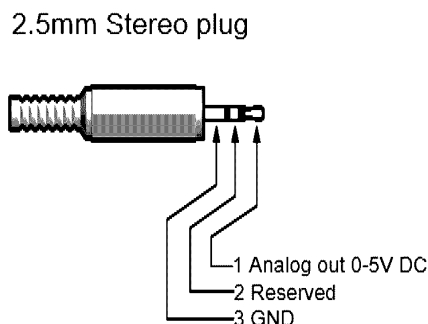
2.4. Analog output

The analog output is a 0 - 5V DC signal.
5V = 1000cN, or 2500 cN in case of tension range 2500 cN.

Recent models   **Previous models**

M8 connector   2.5mm Stereo plug

Analog out 2
1 ---
Gnd 4
*
3 Yarn motion out
Open collector NC

1 Analog out 0-5V DC
2 Reserved
3 GND

*   Only on models with Yarn movement signal output

2.5. Yarn movement signal output

On models with Yarn movement signal output the pin no 3 in the M8 connector is closed to ground when the yarns is not moving. When the yarn is moving the pin has high impedance. Maximum current is 50 mA.
A potentiometer to set the sensitivity is located just above the M8 connector on these models.
To set the sensitivity, turn the potentiometer clockwise to the end position (maximum sensitivity).
Let the machine run while turning the potentiometer slowly counterclockwise until the sensor stops the machine even though the yarn is moving correctly.
Then turn the potentiometer approximately 45° clockwise.
If there are still false stops, increase the setting by another 20° clockwise.

2.6. CAN bus

The tension values can be read on the CAN bus in two different ways.
1. Subscribe i.e. tell specific sensor to continuously send tension values at a selected rate.
2. Direct yarn tension question.

When subscribing the host selects from which sensor and with which data rate it shall receive values. It can also tell the other sensors to look for values above a specified level, an anti check. The advantage is that values can be received at high frequency, over 5kHz. The downside is that only one sensor at a time can send values.

Direct yarn tension question is used if all sensors shall be read continuously. The host sends a command and all sensors answer with yarn tension. The downside with this is that host continuously have to ask and the question consumes bandwidth on the CAN bus. Also, the maximum data rate depends on CAN bitrate and number of sensors connected. With 1 Mbit/s CAN and 12 sensors connected the maximum data rate will be approximately 1kHz.

2.7. Indications

The sensor has a two color indication lamp, red and green.
They have the following meaning.
Steady green: Sensor is OK. (Sensor with Yarn movement signal output: The yarn is not moving.)
Off (with power on)   (Sensor with Yarn movement signal output: The yarn is moving.)
Flashing green/red: Sensor is waiting for CAN address assignment. Check that pin 5 is connected to pin   6 in first sensor, see figure 1.
Flashing red: Sensor has found an error.

3. Communications protocol

3.1. CAN parameters

Standard ID is used, i.e. 11 bits ID.
Bitrate is 500 kbit/s or 1 Mbit/s. See 2.2
Electrical interface according to CiA/DS 102-1.

3.2. Protocol

A message consists of 4 word (8 byte that is maximum for a CAN message).
Every word is sent with high byte first.
There are a number of message types that are separated with different CAN ids.

Message type (11 bits)	CAN ID
Data (1 Word)	Word 1
Data (1 Word)	
Data (1Word)	
Data (1 Word)	Word 4

3.3. Numerical values/text format

Integer types	Description	#bytes
Word	16-bit unsigned short	2

<u>Byte order in CAN message:</u>

Word

bit 15 MSB	
LSB bit 0	byte 0
bit 15 MSB	
LSB bit 0	↓
bit 15 MSB	
LSB bit 0	byte 7
bit 15 MSB	
LSB bit 0	

3.4. Message format

3.4.1. Messages from HOST.

3.4.1.1. Subscription messages

CAN id:	**700**H	SINGLE_CHANNEL_SELECT
Description:	Determines which sensor's (1-Max no of sensors) yarn tension values that shall be sent on CAN bus. The values are sent with the frequency selected with the SAMPLE_RATE_SELECT message. If sensor 0 is selected then the previous selected sensor stops sending yarn tension values.	
Direction:	HOST -> ELTEX tension monitor	
Contents:	One word with the number of the sensor that shall be sent in subsequent SINGLE_SAMPLE messages.	
Answer:	----	
Data structure:	Word 1: Sensor number 0 or 1 - No of sensors.	

CAN id:	**701**H	SAMPLE_RATE_SELECT
Description:	Tells all the sensors with what frequency they shall send yarn tension messages. The frequency is determined by dividing maximum frequency 5,208 kHz with the value in word 1 in this message. If for example 8 is set, then ELTEX tension monitor will send yarn tension messages with frequency 5,208kHz/8 = 651Hz. Power on value is 4 = 1,302kHz.	
Direction:	HOST -> ELTEX tension monitor	
Contents:	One word with the divider.	
Answer:	Only sensor 1 echoes this message with the selected divider.	
Data structure:	Word 1: Divider 1-3000.	

CAN id:	**702**H	SINGLE_ANTI_LEVEL
Description:	Sets a max allowable yarn tension level. The sensors not selected with SINGLE_CHANNEL_SELECT checks this level. If exceeded with number of samples set by SINGLE_ANTI_FILTER, the sensor will send a SINGLE_ANTI_SAMPLE_X message. This message will be received by sensor 1 which in turn will send a SINGLE_ANTI_SAMPLE message to the host. This is done to keep compatibility with multichannel yarn tension sensors. Power on level is FFFFh, which means that this function is off by default. If sensor 0 is selected then the level is written to all sensors.	
Direction:	HOST -> ELTEX tension monitor	
Contents:	One word with the sensor number and one word with the yarn tension level.	
Answer:	The selected sensor echoes this message with its number and level. If all sensors are selected then sensor 1 echoes with sensor number 0.	
Data structure:	Word 1: Sensor number 0 or 1 - No of sensors. Word 2: Yarn tension level 0 - FFFFh.	

CAN id:	**703**H	**SINGLE_ANTI_FILTER**
Description:	Sets the number of samples that the yarn tension must be above the level set by SINGLE_ANTI_LEVEL before a SINGLE_ANTI_SAMPLE_X message is sent. The sample period time is 1/5.208 kHz = 192us. Power on value is 10, which means that signals shorter than 1.92 ms are filtered out. If sensor 0 is selected then the filter value is written to all sensors.	
Direction:	HOST -> ELTEX tension monitor	
Contents:	One word with the sensor number and one word with the filter value.	
Answer:	The selected sensor echoes this message with its number and filter. If all sensors are selected then sensor 1 echoes with sensor number 0.	
Data structure:	Word 1: Sensor number 0 or 1 - No of sensors. Word 2: Filter value 1-30000..	

3.4.1.2. Direct yarn tension question

CAN id:	**708**H	**MULTI_CHANNEL_REQUEST**
Description:	Requests one yarn tension value from all available sensors.	
Direction:	HOST -> ELTEX tension monitor	
Contents:	--	
Answer:	All sensors answer with their CAN id (1-32) and a two byte yarn tension value. Also see message SENSOR_ANSWER.	
Data structure:	None.	

3.4.1.3. Sensor numbering messages

CAN id:	**750**H	**SET_UNIT_IDENTITY**
Description:	Clears, if argument is set to zero, all sensor numbers and starts the automatic assignment again. For this to work, sensor that shall be number 1, the one connected to HOST, must have the daisy signal shortened to ground. Then this sensor sends SET_UNIT_IDENTITY automatically at power up and triggers the automatic sensor number assignment. The HOST does not need to send this message for the sensors to get their identities since it is sent automatically at power up.	
Direction:	HOST -> ELTEX tension monitor ELTEX tension monitor -> ELTEX tension monitor	
Contents:	One word with zero.	
Answer:	All sensors answer one at a time with the same message but with next available sensor number in word 1.	
Data structure:	Word 1: 0=Reassign sensor numbers.	

3.4.2. Messages from ELTEX tension monitor.
3.4.2.1. Subscription messages

CAN id:	**710**H	**SINGLE_SAMPLE_START**
Description:	Tells HOST that SINGLE_SAMPLE transmission starts.	
Direction:	ELTEX tension monitor -> HOST	
Contents:	One word with the sensor number that will be sent in subsequent SINGLE_SAMPLE messages.	
Answer:	----	
Data structure:	Word 1:	Sensor number 1 - No of sensors.

CAN id:	**711**H	**SINGLE_SAMPLE_END**
Description:	Tells HOST that SINGLE_SAMPLE transmission ends.	
Direction:	ELTEX tension monitor -> HOST	
Contents:	One word with the sensor number that has been sent in previous SINGLE_SAMPLE messages.	
Answer:	----	
Data structure:	Word 1:	Sensor number 1 - No of sensors.

CAN id:	**712**H	**SINGLE_SAMPLE**
Description:	Sends tension values for a previously selected sensor.	
Direction:	ELTEX tension monitor -> HOST	
Contents:	One Word with yarn tension value, 0-FFFFh. FFFFh corresponds to the tension monitors upper range, for example 1000cN.	
Answer:	----	
Data structure:	Word 1:	Yarn tension value for sensor previously selected with SINGLE_CHANNEL_SELECT message.

CAN id:	**713**H	**SINGLE_ANTI_SAMPLE**
Description:	Tells HOST that a sensor has exceeded the yarn tension level set by HOST with the SINGLE_ANTI_LEVEL message. The level must also be above for a consecutive number of samples set with SINGLE_ANTI_FILTER message. This message is always sent by sensor 1 and is triggered by a SINGLE_ANTI_SAMPLE_X message from the sensor with a too high level. Only the sensors not selected with SINGLE_CHANNEL_SELECT can send this message. If no sensor is sending SINGLE_SAMPLE messages then transmission of this message is disabled.	
Direction:	ELTEX tension monitor -> HOST	
Contents:	A Word with yarn tension value, 0-FFFFh and a word with sensor number. FFFFh corresponds to the tension monitors upper range, for example 1000cN.	
Answer:	----	
Data structure:	Word 1:	Yarn tension value.
	Word 2:	Sensor that has exceeded yarn tension level.

CAN id:	**730**H-**74F**H **SINGLE_ANTI_SAMPLE_X**
Description:	Tells sensor 1 that a sensor has exceeded the yarn tension level set by HOST with the SINGLE_ANTI_LEVEL message. The level must also be above for a consecutive number of samples set with SINGLE_ANTI_FILTER message. Only the sensors not selected with SINGLE_CHANNEL_SELECT can send this message. If no sensor is sending SINGLE_SAMPLE messages then transmission of this message is disabled. The CAN-id used depends on the sensor's number. 730H is sensor 1 and 74FH is sensor 16. This message is converted by sensor 1 to a SINGLE_ANTI_SAMPLE message to keep compatibility with multichannel yarn tension sensors.
Direction:	ELTEX tension monitor -> Sensor 1
Contents:	A Word with yarn tension value, 0-FFFFh and a word with sensor number. FFFFh corresponds to the tension monitors upper range, for example 1000cN.
Answer:	----
Data structure:	Word 1: Yarn tension value. Word 2: Sensor that has exceeded yarn tension level.

3.4.2.2. Direct yarn tension question

CAN id:	**1-20**H **SENSOR_ANSWER**
Description:	Answer to MULTI_CHANNEL_REQUEST from host. Each sensor answer with its CAN id (1-32) and a two byte yarn tension value.
Direction:	ELTEX tension monitor -> HOST
Contents:	A Word with the current yarn tension value, 0-FFFFh.
Answer:	--
Data structure:	Word 1: Yarn tension value.

3.4.2.3. Sensor numbering messages

CAN id:	**750**H **SET_UNIT_IDENTITY**
Description:	Used by sensor to inform other sensors on the bus about next available sensor number that is sent in word 1. Word 1 will always be nonzero. All sensors will send this message as a reply to a SET_UNIT_IDENTITY message with word 1 set to zero (see 3.4.1.3).
Direction:	ELTEX tension monitor -> ELTEX tension monitor
Contents:	One Word with the next available sensor number.
Answer:	----
Data structure:	Word 1: Number that can be chosen by next sensor.

We reserve the right to modify design and technical data.

ELTEX
OF SWEDEN