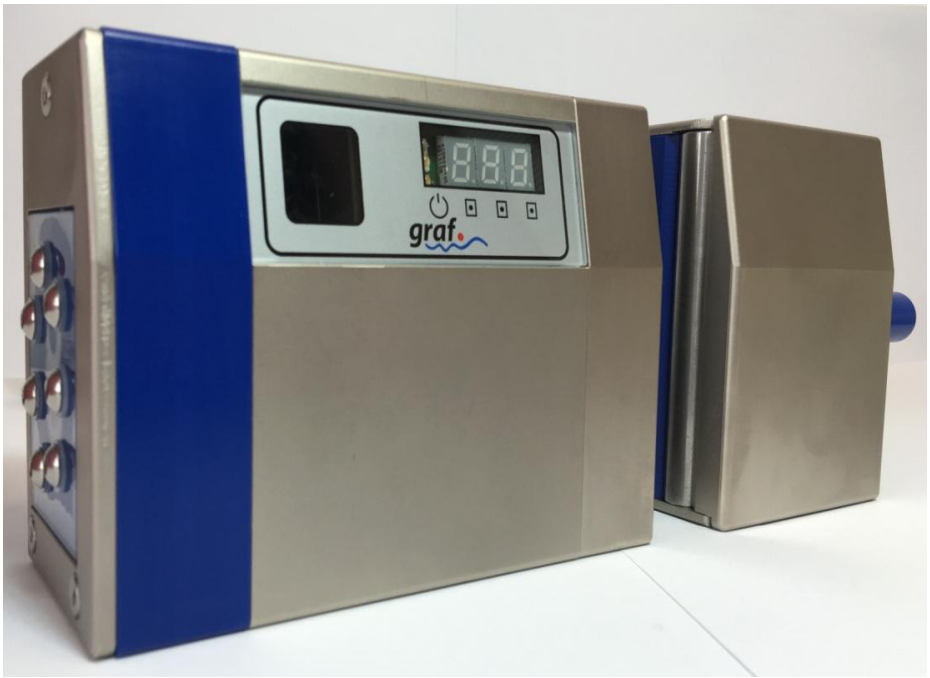
INSTRUCTION MANUAL



SINGLE LUB 2

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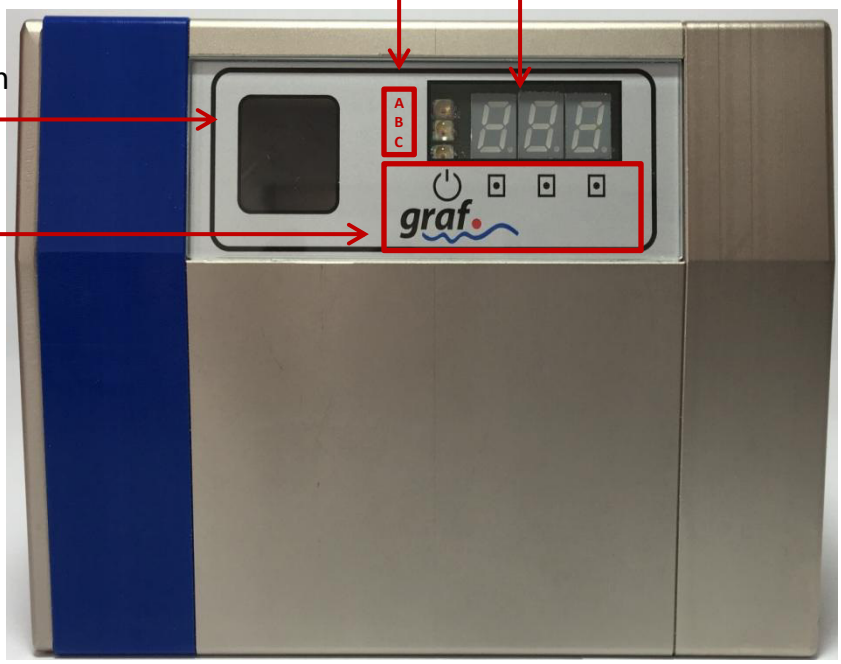
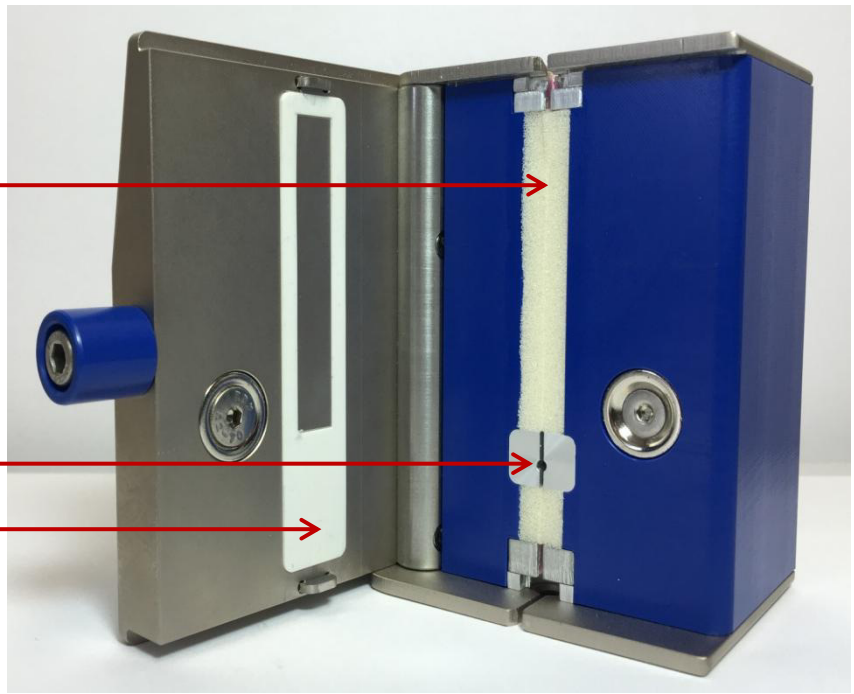
1. Single Lub 2

Front side:

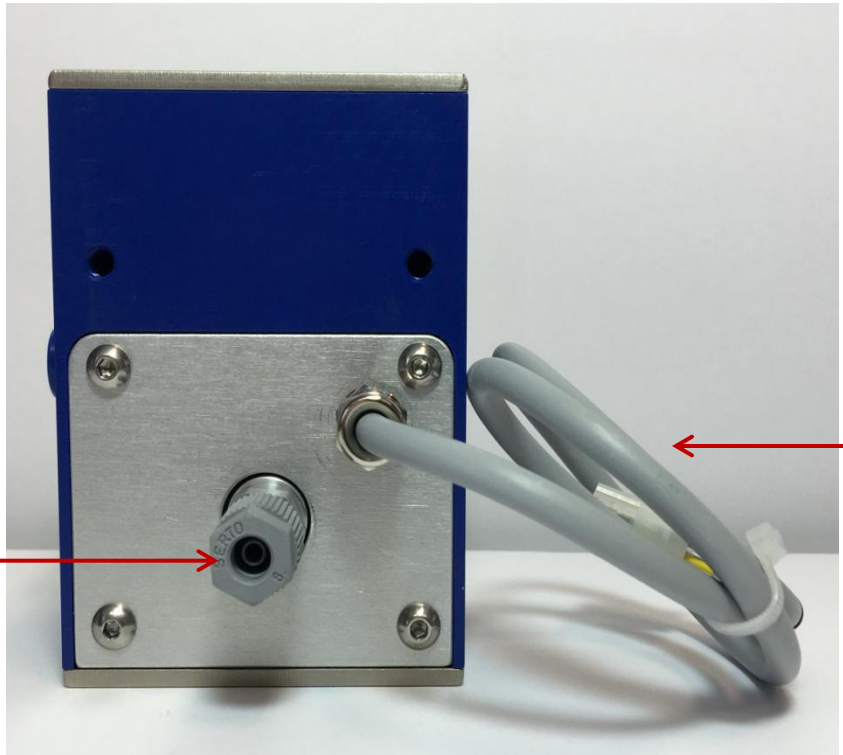


Open / Close

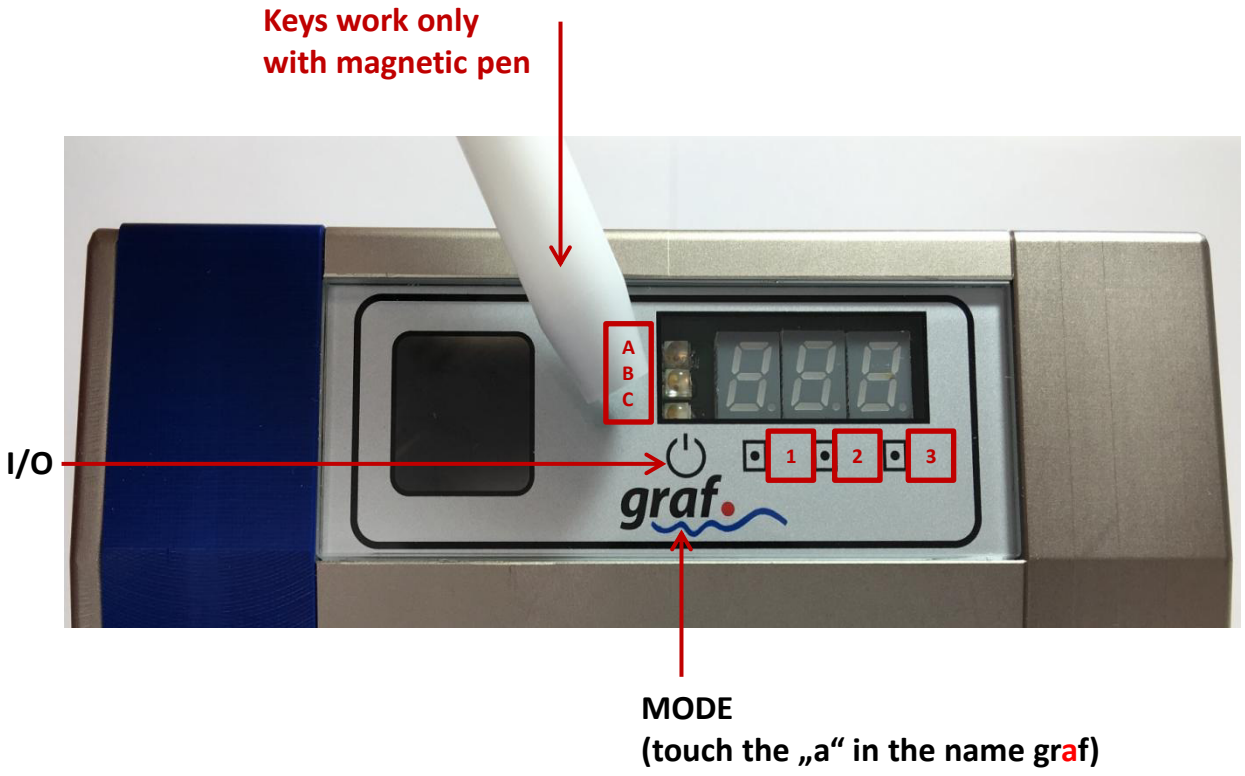


Rear view:


Connector cable to winding machine
Connector cable to applicator
Pump output 1/8 tube connection
Pump input 1/8 tube connection
Graf & Co. GmbH ° Im Farchet 4
D-83646 Bad Tölz ° Tel : 08041/ 7607-0
Spannung Strom Type
24VDC 1,3A Single Lub 2
Leistung Frequenz
24W -
Seriennummer
002-SL2-2015
CE


Connector cable to dosing unit
Lubricant input 1/8 tube connection

Input display:



Description of magnet sensor keys (input keys):

I/O	Key **I/O** turns on/off the lubricant metering. On: the device is on stand-by Off: the device is off, the heating is still on.
MODE	Key **MODE** switches unit to configuration mode. Press the letter “a” in the name gr**a**f. Press key for 6 seconds (Key is only active when pump is not running, green LED **„A“** must be off).
1 2 3	Keys **1,2,3** to set numbers. A short press on key increases number by one.

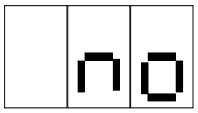
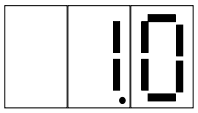
Description of magnet sensor keys (input keys):

A	Green LED lights up when product is being metered.
B	Yellow LED lights up when applicator is below operating temperature (lower than 90% of pre-set temperature).
C	Red LED lights up when metering breaks down.

2. Setting

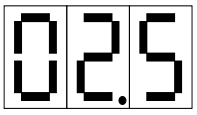
2.1 Programm version

After connecting device to mains electricity supply, display shows first a number indicating version number of programme:

Here for example version 1.0

Immediately afterwards, unit shows last output setting in g/min.



Here for example unit is set to an output of 2.5 g/min.

2.2 Feeding Rate Calculation

To calculate the lubricant quantity setting for the dosing unit, please use the following formula:

$$\text{Setting}\left[\frac{\text{g}}{\text{min}}\right] = \frac{\text{threadspeed}\left[\frac{\text{m}}{\text{min}}\right]}{\text{Nm}_{\text{eff}}\left[\frac{\text{m}}{\text{g}}\right]} \frac{\bullet\,\text{uptake}[\%]}{\bullet\,\text{lub activity}[\%]}$$

With:

Thread speed $\left[\frac{\text{m}}{\text{min}}\right]$ = winding speed

Uptake $[\%]$ = quantity of lubricant to be applied to the yarn in % of yarn weight.

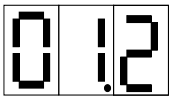
Nm $_{\text{eff}}\left[\frac{\text{m}}{\text{g}}\right]$ = the weight of the yarn; how many meters of yarn per one (1) gram.

Lub activity $[\%]$ = the % of active material (solid matter) in the lubricant

Calculation example

Thread speed: 1200 m/min
Uptake: 3.5 %
Nm eff: 35 m/g
Lube activity: 100%

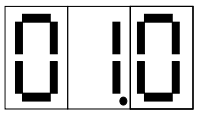
$$\text{Setting}\ \frac{\text{g}}{\text{min}} = \frac{1200\frac{\text{m}}{\text{min}}\ \text{x}3.5\%}{35\frac{\text{m}}{\text{g}}\ \text{x}100\%} = 1.2\frac{\text{g}}{\text{min}}$$

⇨ device setting 

NOTE: In speed clock operation mode CL 1 – CL 8 (see chapter 3) the input of the lubricant feeding quantity is made in g/km (grams per kilometer of thread) and not in g/min (grams per minute).

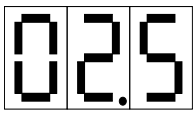
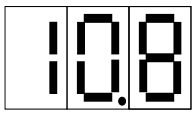
Calculation Example ONLY for setting CL 1 or CL 8

$$\text{Setting}\left[\frac{\text{g}}{\text{km}}\right] = \frac{\text{uptake}[\%] \bullet 1000}{\text{Nm}_{\text{eff}}\left[\frac{\text{m}}{\text{g}}\right] \bullet \text{lub activity}[\%]}$$

$$\text{Setting}\left[\frac{\text{g}}{\text{km}}\right] = \frac{3.5\% \bullet 1000}{35\frac{\text{m}}{\text{g}} \bullet 100\%} = 1\frac{\text{g}}{\text{km}} \Rightarrow$$ to set 

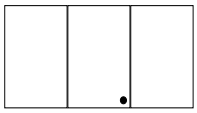
2.3 Setting of output

The output can now be adjusted using the keys **1, 2, 3**. Each digit must be set separately. With each press on the key, the corresponding number increases by 1.
Once the number 9 is passed, the unit return to zero.

To change for  example to 

press the key **1** once, the key **2** eight times and the key **3** three times.
Thus the output of 2.5 g/min has been changed to 10.8 g/min. This setting remains the same until the next adjustment, even if the device is disconnected in the meantime.

2.4 Turn on/off

With the **I/O** key the pump can be turned off. The display indicates: 

The luminous decimal point of the second digit indicates that the pump is in off mode and will not meter even if the winding machine is working.

By another press on the **I/O** key the pump is changed to on mode and the display shows the value which was indicated before. The applicator is still hot.

2.5 Applicator Temperature

The current applicator temperature can be displayed by pressing MODE key at short term. In this mode, the display shows degree sign (°) plus the current applicator temperature in degrees Celsius.

In order to exit applicator temperature display mode, press the MODE key once more.

This mode just displays the current applicator temperature.

The applicator temperature can be changed within a range of 20 to 80 degrees Celsius by modifying the AtP Applicator Temperature Value in the configuration menu (see chapter 3.)
The standard setting is 60 degrees Celsius.

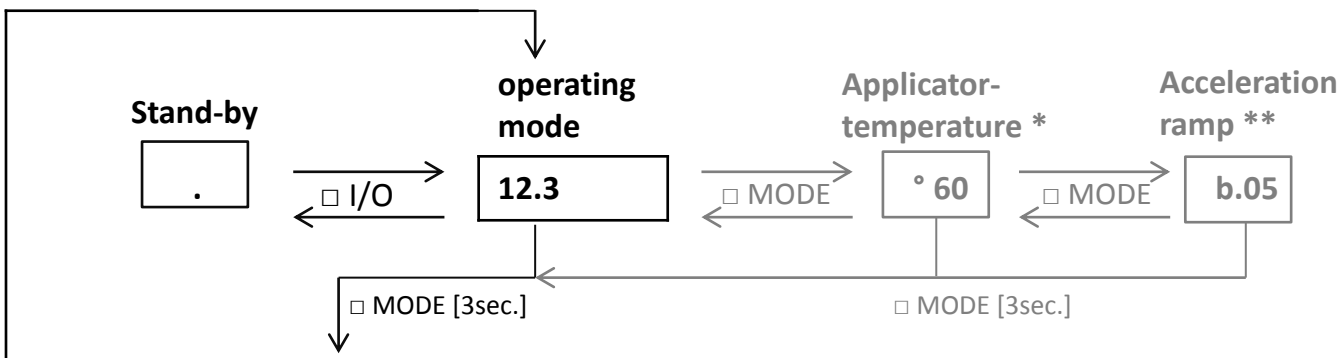
3. The configuration menu:

The device can be configured for different applications by using the **MODE** key. By pressing this key repeatedly, several points of the menu are passed through which can be configured as required.

ATTENTION: Only enter the configuration menu if changes are absolutely necessary. A careless change of any parameter may lead to a malfunction of the device.

To enter the configuration menu, the **MODE** key must be pressed for 3 sec. After the last menu item has been passed, the configuration menu is left automatically.
To leave the configuration menu prematurely, the **I/O** key must be pressed. Changed parameters are automatically saved.

The configuration menu is passed through in the following order:



□ I/O	t.60	**Test run** time based	t.01 .. t.99

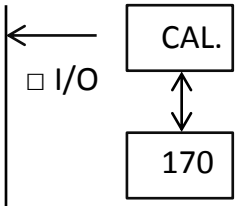
□ MODE

The time based test run is for feeding lubricant with the Quantity set at the Operating Mode for a determined count of seconds. The Run starts by pressing I/O and stops automatically when the time count-down has reached 00. The Test Run can be aborted at any time by pressing I/O.
Default-value: t.60

□ I/O	r.50	Test run turn based	r.01 .. r.99

The turn based test run is for feeding lubricant with the Quantity set at the Operating Mode for a determined number of gear wheel turns. The Test run starts by pressing I/O and stops automatically when the turns you have set are done. The Test Run can be aborted at any time by pressing I/O.
Default-value: r.50

□ MODE



□ I/O

Calibration of feeding quantity
Pump feeding quantity calibration.

050 ..250

This value determines the calibration setting of the pump head. The value set describes the feeding quantity of the pump in milligram / turn. At this menu point the display shows alternately “CAL” and the value set.
Default-value: nothing
ATTENTION:
Setting this to an improper value leads to an incorrect feeding quantity.

□ MODE

□ I/O

F.65

Fluid motion controller sensitivity
determines sensitivity of the flow motion controller.

F.00 ..F.99

The reaction time of the flow motion controller can be set using this value. The higher the value, the faster the fluid motion controller reacts. Normal reaction delay should be within 50 ..70 seconds.
Default-value: F.65

□ MODE

The red LED **C** lights up when the reaction point has been reached. For test purposes, the moment the parameter F is entered, the flow motion sensor starts to detect if lubricant is flowing through the pump. As the motor is not running and no lubricant is moving in this mode, the flow motion sensor should show an error after approx. 1 minute. The red LED **C** indicates the error. With the value 00 the flow motion sensor is completely switched off.
ATTENTION:
If this value is changed (especially by increasing the sensitivity), the red LED **C** might light up during normal operation. The control unit is already factory – set at the value of 65, which corresponds to the required sensitivity of approximately 1 minute after interruption of output. When the red LED **C** lights up, the winding machine is stopped by the metering device (only if connected).

← A.02 □ I/O ↓ □ MODE	**Applicator setting** determines type of applicator used.	A.00..A.03	A.00: Cold applicator, no check of temperature A.01: Cold applicator with Clean-Start (1.5 rotations). A.02: Hot applicator A.03: Hot applicator with automatic temperature reduction at standstill * Temperature display only active with activated hot applicator
← Ad.0 □ I/O ↓ □ MODE	**automatic temperature reduction** determines delay of temperature decrease	Ad.0..Ad.6	If A.03 (hot applicator with automatic temperature reduction at standstill) was selected in the applicator setting, this menu item is activated and the time delay of the automatic temperature reduction when the pump is at a standstill can be specified in 6 steps. Ad.0: No delay (immediate temperature reduction at standstill) Ad.1: temperature reduction 10 seconds after standstill Ad.2: temperature reduction 30 seconds after standstill Ad.3: temperature reduction 1 minute after standstill Ad.4: temperature reduction 2 minutes after standstill Ad.5: temperature reduction 5 minutes after standstill Ad.6: temperature reduction 10 minutes after standstill
← AtP. ↕ °60 □ I/O ↓ □ MODE	**Applicator temperature** determines temperature of applicator	°20 ..°80	At this menu point the control temperature of the Hot Applicator (if connected and with A.02 / A.03 activated) is set. The temperature value between 20 and 80 degrees is entered in ° C. At this menu point the display shows alternately “AtP.” and the value set of temperature. Default-value: °60

← □ I/O

CL.0

Clock operating mode determines the clock operating mode.

CL.0 ..CL.8

CL.0: No Clock Input
CL.1: With acceleration ramp (ramp reset on every pump restart)
CL.2: With acceleration ramp (ramp reset only on reset input signal)
CL.3: Clock operating mode
CL.4: Clock operation mode with clock-controlled release
CL.5: Clock-controlled release only
CL.6: Clock operation mode with clock-drop-detection
CL.7: Clock operation mode with clock-controlled release and clock-drop-detection
CL.8: Clock-controlled release only with clock-drop-detection
Default-value: CL.0

** Acceleration ramp only active with corresponding setting

↓ □ MODE

← □ I/O

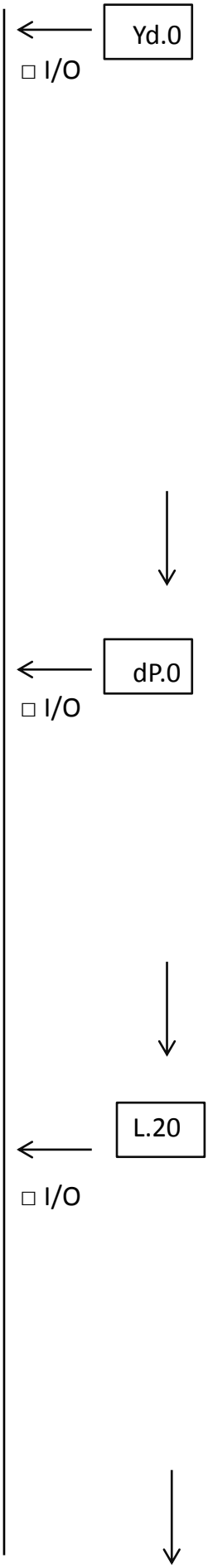
C.10

Clock input rate setting determines the clock input rate in pulses/ meter

C.01 ..C.50

When the system is used on a winding machine with a non-constant thread speed, the system must be connected to a speed signal equivalent to the thread speed. The C.-Value must be equal to the count of pulses per meter of thread, delivered by the thread-reel on the meter-counter. This menu item is only activated if the setting CL.3 to CL.8 was selected in the clock operating mode.
Default-value: C.10
The input signal is connected to the grey cable (see Schematic diagram chapter 7).

↓ □ MODE



Yd.0

□ I/O

Yarn Detector Operating Mode
Using this mode, a Yarn Detector can be attached to the System which control star and stop of the pump

□ MODE

Yd.0..Yd.2

In addition to the release of the pump supply by means of an external release signal and clock control, a pump release can optionally be carried out with an externally connected Yarn Detector.
Yd.0: No Yarn Detector used
Yd. 1: Yarn Detector with active-high output signal used
Yd. 2 Yarn Detector with active-low output signal used
Default-value: Yd. 0

dP.0

□ I/O

Motor decade and gear setting
sets lub quantity decade setting

□ MODE

dP.0 / d.P1 / d.P2

dP.0: Feeding Quantity Input with 1 decade after comma (e.g. 12.3 g/min)
dP.1: Feeding Quantity Input with 2 decades after comma (e.g. 1.23 g/min)
dP.2: Feeding Quantity Input with 2 decades after comma – only for use with 10:1 motor gear (e.g. 1.23 g/min)
Default value: dP.0

L.20

□ I/O

Maximum Feeding Quantity Limitation
Limits the max. Adjustable Lub Quantity

□ MODE

L.05 ..L.40

This value limits the maximum settable feeding quantity in operation mode to the value set here, given in grams per minute for non-clock-operation and grams per 1000 m of thread in clock operation respectively.
Default-value: L.20

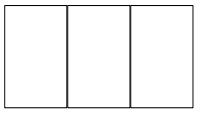
← □ I/O	u.05	**Acceleration time at pump start**	u.00..u.30	This setting determines the acceleration time from when the pump is started until the feed quantity set has been reached. With setting u.00, the pump feeds immediately with the specified feeding quantity. Default-value: u.05 The value 05, for example, means that the adjusted output is reached within 5 seconds after starting the pump. This value should be chosen according to the acceleration of the winding machine. The minimum value is 0, the maximum value is 30 seconds.
↓ □ MODE				
← □ I/O	d.01	**Deceleration time at pump stop**	d.00..d.30	This setting determines the deceleration time from when the pump is stopped until the feed quantity is zero. With setting d.00 the pump stops immediately after switching off. Default-value: d.01 **NOTE:** deceleration begins at the moment the pump is switched off.

END OF SETTINGS

Menu EXITS to set metering quantity

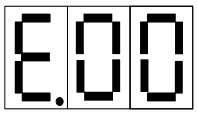
4. Error messages:

Should any fault happen during operation – for example, in the case of a cable break or if the pump runs dry – this is indicated by an alarm signal and the winding machine is automatically stopped (only if yellow cable is connected). If possible the display indicates the corresponding error message.
The fault is indicated by a capital E in the first place followed by a number explaining the cause of the fault.



4.1 Nothing on the display

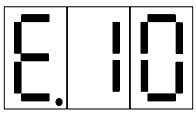
Possible cause	Remedial measures
Electronic fault	Check power supply



4.2 Loss of data

→ The configuration steps of the device are lost.

Possible cause	Remedial measures
Processor IC on the printed board has been exchanged	Create new settings in the configuration menu

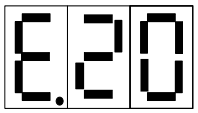


4.3 Failure of applicator (only with hot application)

→ The applicator has not reached the working temperature.

NOTE: This error message only appears during winding. Additionally to this error message the yellow LED **B** lights up, also when the winding machine has already been stopped.
The error message is automatically cancelled as soon as the applicator has reached the nominal temperature.

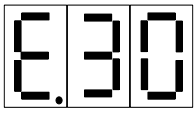
Possible cause	Remedial measures
Applicator is still heating up	Wait for 5 minutes until the heating up is finished
The internal connector of the applicator is not plugged in at the device	Check the connector
Applicator or device is out of order	Exchange the applicator heater or the device and send it for repair



4.4 No speed pulses (only for coupling with yarn speed)

⟶ The clock signal of the winding machine is missing

Possible cause	Remedial measures
Device set to CL 3 or CL4 but grey cable is not connected to receive speed pulses	Connect grey cable or set to CL0, CL1 or CL2
Yarn has not been attached to the wheel of the speed sensor	Attach yarn in such a way that the wheel of the speed sensor turns with yarn speed
The connector of the wheel is not plugged in at the device (grey cable)	Check connector
The wheel of the speed sensor or the device is defective	Exchange the wheel or the device and send in the part for repair

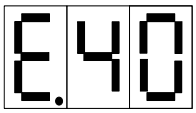


4.5 Breakdown of output, overtaxing

⟶ The output capacity of the pump has been exceeded.

NOTE: This fault can only appear when output and yarn speed are coupled.

Possible cause	Remedial measures
The output has been set too high	Regulate the output with a lower value
The winding machine is running too fast so that the pump cannot meter the required quantity of output	Reduce the winding speed



4.6 Alarm signal of the flow motion sensor

⟶ The flow motion sensor indicates:
No product is being metered.

NOTE: The red LED **C** lights up in addition to this error message.

Possible cause	**Remedial measures**
The drum is empty: there is no more product left	Check the lubricant in the drum
The plastic flexible tube leading to the pump is buckled, blocked or disconnected	Check all flexible tubes leading to and coming from the pump and exchange them if necessary
The applicator or the pump is blocked	Clean applicator or pump
The output has been adjusted to the value <00.3 g/min	Check the output setting
The sensitivity of the flow motion sensor has been set too high	Set the flow motion sensor to a lower sensitivity (see “test and setting of the flow motion sensor”)
Device is defective	Exchange device and send it for repair.

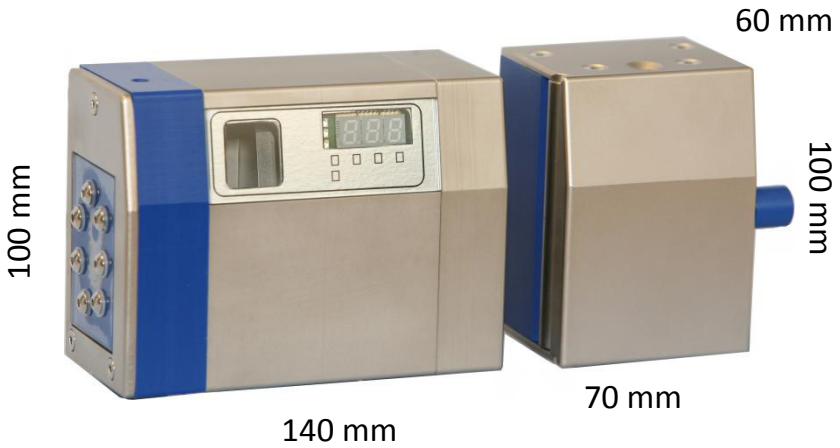
5. Technical data:

Operation	Connected to current: 10 – 40 °C Air humidity: 0 – 80% (not condensating)
Storage	0 – 50 °C Air humidity: 0 – 80% (not condensating)

Electrical data:

Power supply	24 VDC
Current consumption	Off mode 1W Standby 2W Running 5W With hot applicator: heating 30W With hot applicator: standby 15W

Dimensions (approx.)



6. Complete overview Error messages

Error message	Error message description	Is displayed...	Action	Confirmation/Reset
E.00	**System EEPROM Data Loss** The pumping device EEPROM has been deleted or was not yet configured (new device)	Once the Error has occurred	Machine disabled	MODE or I/O Button
E.01	**Pump Head EEPROM Data Loss** The pump head EEPROM has been deleted or was not yet configured (new device)	Once the Error has occurred	Machine disabled	MODE or I/O Button
E.02	**Pump Head EEPROM Erase Failure** The pump head EEPROM has not been deleted successfully	Once the Error has occurred	Machine disabled	MODE or I/O Button
E.10	**Hot Applicator Temperature Error** The Hot Applicator connected to the system is not yet heated up entirely to its set temperature or isn't able to keep its temperature level above a fixed threshold of 5 degrees Celsius below the set temperature by any reason. This error message is only displayed when the error persists while the pump is being started. The error message can then be confirmed by the action described	As long as the Error is persistent and the System gets an external Run Signal.	Machine disabled	MODE or I/O Button when there is no external Run Signal or when the Error disappear by itself
E.11	**Hot Applicator Sensor Error** The Hot Applicator connected to the system has a faulty or broken NTC temperature sensor. Alternatively, the power cord to the applicator was damaged or the applicator isn't connected properly	As long as the Error is persistent and the System gets an external Run Signal.	Machine disabled	MODE or I/O Button when there is no external Run Signal or when the Error disappear by itself

Error message	Error message description	Is displayed...	Action	Confirmation/Reset
E.20	**Clock Input Signal Missing** This error message appears when the clock input signal is missing or the Clock Signal Input Frequency is below 0.5Hz while the Clock Operating Mode is enabled at Clock Operating Mode 2 or 3 and the pump is started.	As long as the Error is persistent and the System gets an external Run Signal.	No action	MODE or I/O Button when there is no external Run Signal or when the Error disappear by itself
E.21	**Maximum Clock Signal Input Frequency Exceeded** The maximum allowable Clock Signal Input Frequency in Clock Input Operation Mode 2 or 3 exceeds over ist computable range. In this case, the Clock Signal Input Frequency is clamped at its maximum limit. The range maximum limit is 1000Hz.	As long as the Error is persistent and the System gets an external Run Signal.	No action	No confirmation possible
E.30	**Maximum Feeding Quantity Exceeded** This error message appears when the motor rotational speed is too high so that the motor may not be able to keep track on this speed without losing steps.	As long as the Error is persistent and the System gets an external Run Signal.	No action	No confirmation possible
E.40	**Fluid Motion Controller Flow Error** The Fluid Motion Controller has detected a lubricant flow error.	Once the Error has occurred	Machine disabled	MODE or I/O Button
E.41	**Pump Head Missing Error** The Pump has been started without a proper Pum Head attached to the system	As long as the Error is persistent and the System gets an external Run Signal.	Machine disabled	MODE or I/O Button when there is no external Run Signal
E.42	**Pump Head Fluid Motion Sensor Error** The Pump Head's Fluid Motion Sensor is faulty or the wiring to the Sensor is broken	As long as the Error is persistent and the System gets an external Run Signal.	Machine disabled	MODE or I/O Button when there is no external Run Signal

Error message	Error message description	Is displayed...	Action	Confirmation/Reset
E.43	**Pump Head Fluid Motion Sensor Offset Error** The Pump Head's Fluid Motion Sensor Offset DAC is not calibrated or faulty or the wiring to the DAC is broken	As long as the Error is persistent and the System gets an external Run Signal.	Machine disabled	MODE or I/O Button when there is no external Run Signal
E.44	**Pump Head Fluid Motion Sensor ADC Error** The Pump Head's Fluid Motion Sensor Acquisition ADC is not present or faulty	As long as the Error is persistent and the System gets an external Run Signal.	Machine disabled	MODE or I/O Button when there is no external Run Signal
E.50	**Pump Test Run Error** The system has detected a problem during execution of the Pump Test Run. The Pump Test Run must be repeated	Once the Error has occurred	No action	MODE or I/O Button
E.51	**Pump Test Feed Error** The system has detected a problem during execution of the Pump Test Feed. The Pump Test Feed must be repeated	Once the Error has occurred	No action	MODE or I/O Button
E.60	**Machine Enable Output Error** The Machine Enable Output Transistor is overloaded or shorted to +24VDC. Although the output transistor is properly protected from this condition, the Machine Enable Function may not work. Consequently, system errors may not stop the machine reliably.	As long as the Error is persistent	Brings Transistor Output in hiccup mode as long as condition persists	No confirmation possible
E.61	**Stepper Motor Driver Error** The Stepper Motor Driver reports an error or is in fault condition	As long as the Error is persistent and the System gets an external Run Signal.	Machine disabled	MODE or I/O Button when there is no external Run Signal or when the Error disappear by itself

Error message	Error message description	Is displayed...	Action	Confirmation/Reset
E.70	**Low Power Supply Voltage Error** The Power Supply Voltage of the system is below 20VDC. This may cause the pump motor to lose its torque for driving the pump head properly and the applicator to maintain its set temperature at high feeding quantities.	As long as the Error is persistent	Machine disabled	No confirmation possible
E.71	**High Power Supply Voltage Error** The Power Supply Voltage of the system is above 30VDC. Further increase of the Power Supply Voltage may cause the device to be damaged.	As long as the Error is persistent	Machine disabled	No confirmation possible

Status LED Description Single Lub 2

Status LED	Status LED description	Is ON...
RED	Fluid Motion Controller and Hal Sensor DIGIT Button pressed indicator	- As long as a Fluid Motion Controller Error (E.40 – E.44) is persistent - While a Hal Sensor DIGIT Button is pressed
YELLOW	Hot Application Error indicator	- As long as a Hot Applicator Error (E.10 – E.11) is persistent
GREEN	Pump Run indicator	- While the Pump Motor is running

7. Diagram electrical installation on winding machines

IMPORTANT:
For enabling the Single Lub 2, on some machines the “Graf oiling System”, has to be enabled in the Machines P.L.C. settings.
For details, please refer to the Machines manual.