EWIKON

Electrical drive unit
for valve gate systems

Operating manual for controllers and PC setup software EDC (E-Drive-Control)

EWIKON

Safety notes:

Before working on the plant, ensure it has been disconnected from the power supply. Set the power switch to OFF and disconnect the mains plug. Connection, repair and maintenance work may only be carried out by qualified skilled personnel.

Before starting up, the plant must be checked in accordance with EN 60204 – 1 or generally accepted standards of engineering practice. The connected components can get very hot, there is also a risk of crushing. Appropriate precautions must be taken for the starting up and operation as well as maintenance and repair.

Scope:

This EWIKON control system can be used to operate valve gate nozzles with electrical needle drive of EWIKON Heißkanalsysteme GmbH & Co KG in dry industrial rooms.

Contents

Features

Control unit and drive units

- Unrestricted **clean room suitability**

- **Powerful drive, individual control** for each needle

- **Variable stroke length** and needle speed

- **High-precision needle positioning,** 0.02 mm step width

- **Intelligent fault management** with monitoring of the set needle position and automatic position correction

- **Easy installation, simple mould design,** no supply bores in the clamping plate needed

- **Low energy consumption** of the drive units

- **Clear controls**, easy to learn

PC software for start-up

- **Common referencing** of all needles for "CLOSED" position

- **Adjustable speed** for "OPEN needle" and "CLOSE needle"

- **Step width** in **setup mode** can be chosen between 0.10 mm, 0.05 mm and 0.02 mm

- **Variable signal delay time**, to compensate for machine control requirements

- **Trigger signal adaptable** to various features of the injection moulding machine

- **Individual setting for needle stroke,** deactivation of individual needles

- **Clear** and easy to learn **user interface**

- Can be run on any **standard PC** or **laptop with Windows operating system**

- **Storage capability** for various tool settings

Display elements and controls

The EDC control unit is controlled using a few switches and buttons on the front of the unit, the power switch for switching on the supply voltage and the unit fuse (F6.3A) are all attached to the rear. Furthermore, several LEDs are available for signalling function and error statuses. The interface can be used to connect the unit to a PC in order to use the PC setup software to adapt the control unit to the application. A PC connection is not required for normal production operation.

The small number and clearly arranged controls and display elements ensure simple and easy to learn use of the unit. This minimises the risk of maloperation.

No.	Name	Function
1	Mode	Operating mode selector switch: Automatic / Setup
2	Needle	Needle selector switch
3	"OPEN" button	Button for manual set-up and special functions
4	"CLOSE" button	Button for manual set-up and special functions
5	"24V DC"	Connector for supply voltage of operating unit
6	RS232	Interface for PC or operating unit
7	"OPEN" LED	"OPEN needle" display
8	"CLOSE" LED	"CLOSE needle" display
9	"POWER" LED	"Control in operation" display
10	"ERROR" LED	Error display

Please read these operating instructions carefully before starting up the control unit and the connected drive units to avoid damage to the controller or to the mould.

Connection and start-up, connector pin assignment

The connectors of the valve gate control unit for connecting to the controls of the injection moulding machine and the mould (drive units) are located on the rear of the unit. The mains connection, power switch and fuse are also located here.
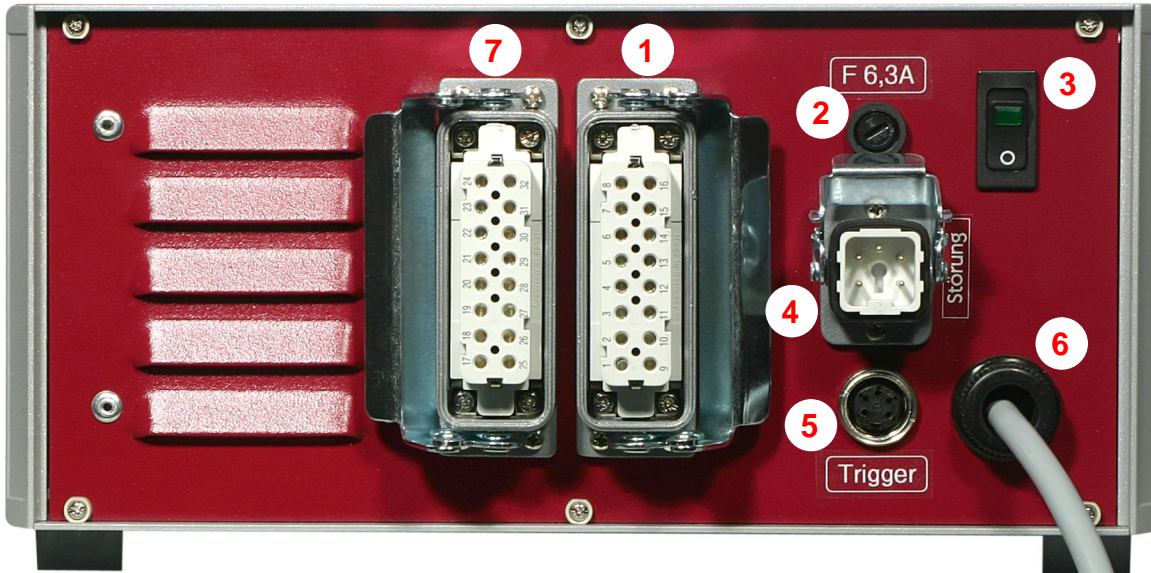
| No.	Name	Function
1	Connector for drive units	Connector for connecting the drive units 1-4 to the mould
2	Fuse	Unit fuse, F6.3A (additional internal fuse F1.0A for 24V DC)
3	Mains switch	Switch for power supply
4	Error signal output	Error signal output to the injection moulding machine
5	Signal jack	Trigger signal from the injection moulding machine
6	Mains connection	Mains connection cable, operating voltage 230V +5/-10%, 50-60Hz
7	Connector for drive units	Connector for connecting the drive units 5-8 to the mould (for 8-zone controller 68050.008)

The following procedure should be followed to connect and start up the control unit in order to avoid possible problems:

A trigger signal from the injection moulding machine is required to control the drive units: it triggers the lifting motion of the drive units. The "start build-up clamping force" signal is preferably used to open the needles, alternatively the "close mould" or "start injection" signal can be used. If a signal is applied, the needles open and remain in this position, if the signal is cancelled the needles close again. If the trigger signal is not made available by the injection moulding machine's controls in the described form, an adjustment must be made using the PC software. **Further possibilities and features are listed in detail in the software description starting on Page 10.**

The trigger signal is electrically connected to the control unit of the machine by using the attached signal cable, Item number 60070.023. Two different versions are possible:

1) The injection moulding machine provides the 24V DC output signal:
   The output signal + 24V DC is connected to contact 2 (green core), the machine's earth is connected to contact 5 (brown core).

2) The injection moulding machine provides potential free contact:
   The potential free contact of the controls of the injection moulding machine is connected to contact 1 (white core) and contact 2 (green core) of the valve gate control unit.

Contact / core	Name	Use
1 / white	+24V DC	Signal voltage +24V
2 / green	"OPEN" (+24V)	Signal input, "OPEN" needle
3 / yellow	"CLOSE" (+24V)	"CLOSE" needle pulse input
4 / grey	3rd Position/ Analogue	Option (on request)
5 / brown	GND	Ground
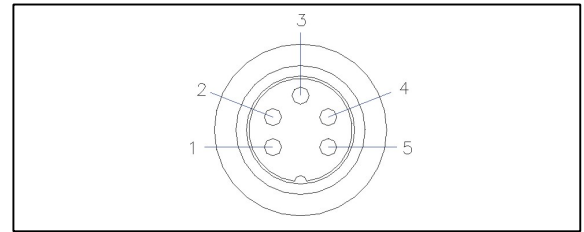
For connecting the drive units in the mould with the control unit the enclosed cable, item number 60070.024, is used. It is specially designed for this application with a screened configuration. The cable is preassembled ready to connect and can be used to connect up to 4 drive units. The assignment is listed in the following table.

| Contact	Use	Drive unit cable assignment
1 / 2 / 3 / 4	Drive unit 1	red / red-white / green / green-white
5 / 6 / 7 / 8	Drive unit 2	red / red-white / green / green-white
9 / 10 / 11 / 12	Drive unit 3	red / red-white / green / green-white
13 / 14 / 15 / 16	Drive unit 4	red / red-white / green / green-white
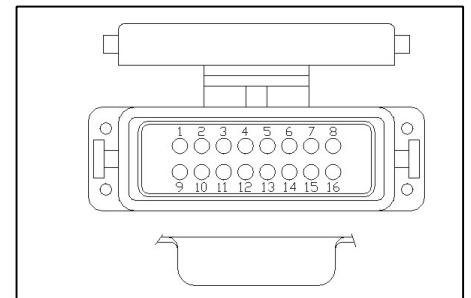
IMPORTANT: **The drive units may only be connected or disconnected when the control unit is switched off, otherwise the output modules can be damaged! The drive units are supplied with electricity even when they are stopped in order to generate the necessary retention forces.**

The maximum permanent operating temperature for the drive units is 80°C. Please ensure by appropriate measures (cooling, ventilation) that this temperature is not exceeded.

If necessary, the error signal output of the control unit can be connected to the injection moulding machine in order to report any errors or faults that occur to the primary control unit and to trigger an operator reaction. Therefore, the control unit is equipped with a potential-free change-over contact which can be loaded with 6A / 250V.

Contact	Use
1	Common connection
2	NC
3	NO
4	Not used
PE	Protective conductor
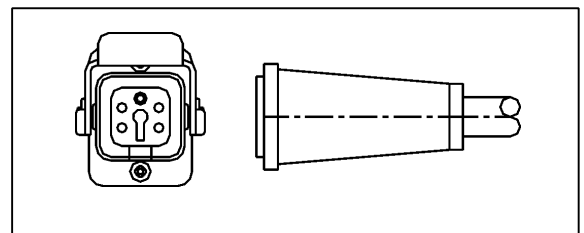
Before inserting the mains connector or connecting the mains connection cable make sure that the supply voltage conforms with the data given on the type plate of the valve gate control unit.

Further use of the control unit, setting up the drive units for the application and adjusting the functions to the control unit of the injection moulding machine take place in accordance with the following chapter. Before using the electric valve gate control unit for the first time, it is therefore recommended you read the complete operating instructions in order to achieve an optimum function.

IMPORTANT: **The valve gate control unit should not be switched on until the hotrunner has reached its set temperature and the plastic to be processed has melted completely!**

Operating the control unit

Introduction

The control unit is operated using a few buttons and switches on the front, thereby ensuring fast familiarisation and fault-free operation. A differentiation is made between "AUTOMATIC" and "SETUP" mode. The 4 LEDs can be used to follow all the operating steps and to identify any faults. During operation the "POWER" LED indicates the unit is ready for operation.

"SETUP" mode (I)

This mode is used to adjust the "CLOSE" position (gate closed) of individual needles, if this is still required after mechanical tuning. The length of the needles is usually designed so that they can be inserted a further maximum 0.5mm into the cavity (protection of the ejector sided contour plate). When adjusting in OPEN direction a larger adjustment range is possible.

Needle selection
This switch selects the drive unit for the needle to be adjusted. In a control unit for 4 drive units, the "ERROR" LED lights up if a needle > 4 is selected, thus signalling the incorrect selection. All positions can be used in a control unit for 8 drive units.

Individual adjustment of the needle
The selected needle is adjusted by briefly pressing the "OPEN" or "CLOSE" button, depending on the direction in which the adjustment is necessary. Each time a button is pressed the corresponding direction LED briefly lights up in order to acknowledge the input. With each stroke the needle is moved by 0.1mm in the required direction, the PC software can be used to reduce this increment to a value of 0.05 mm, 0.02 mm or 0.01 mm for finer adjustments.
If the direction buttons are pressed for longer than > 3 seconds, continuous running of the drive units is triggered, e.g. in order to carry out inspection or maintenance work.

"AUTOMATIC" mode (0)

Production takes place in this mode or special functions are performed in order to reference the positioning or to move the needles into a maintenance position. To avoid accidental adjustment of the needles the operating mode selector switch should be reset to the "AUTOMATIC" position immediately after the individual adjustment.

Production mode
In "AUTOMATIC" mode the control unit is always ready for production and waits for a trigger signal from the injection moulding machine. Then the needles are opened and closed with the preset settings or those changed using the PC software. Depending on the necessity, the traversing speed and therefore the forces acting on the needles, the opening and closing behaviour and the strokes of the individual needles can be adapted to the application. The control unit can also be run without the PC using the default values (shown in the table on page 10).

Reference run after error

A special monitoring function is integrated in the control unit which monitors the movement of the needles and therefore detects and corrects incorrect positioning. A current measurement is taken while the needle is moving and compared with a limit value to detect any excessive power requirement (e.g. gate blocked) and any resulting incorrect positioning of the needle. The next time the needle is opened it is automatically followed by a reference run to the rear mechanical limit stop and the positioning is readjusted. The drive concerned then runs with the correct position data once more. If the control unit cannot carry out automatic correction because of a permanent problem, an error signal is issued via the error signal output.
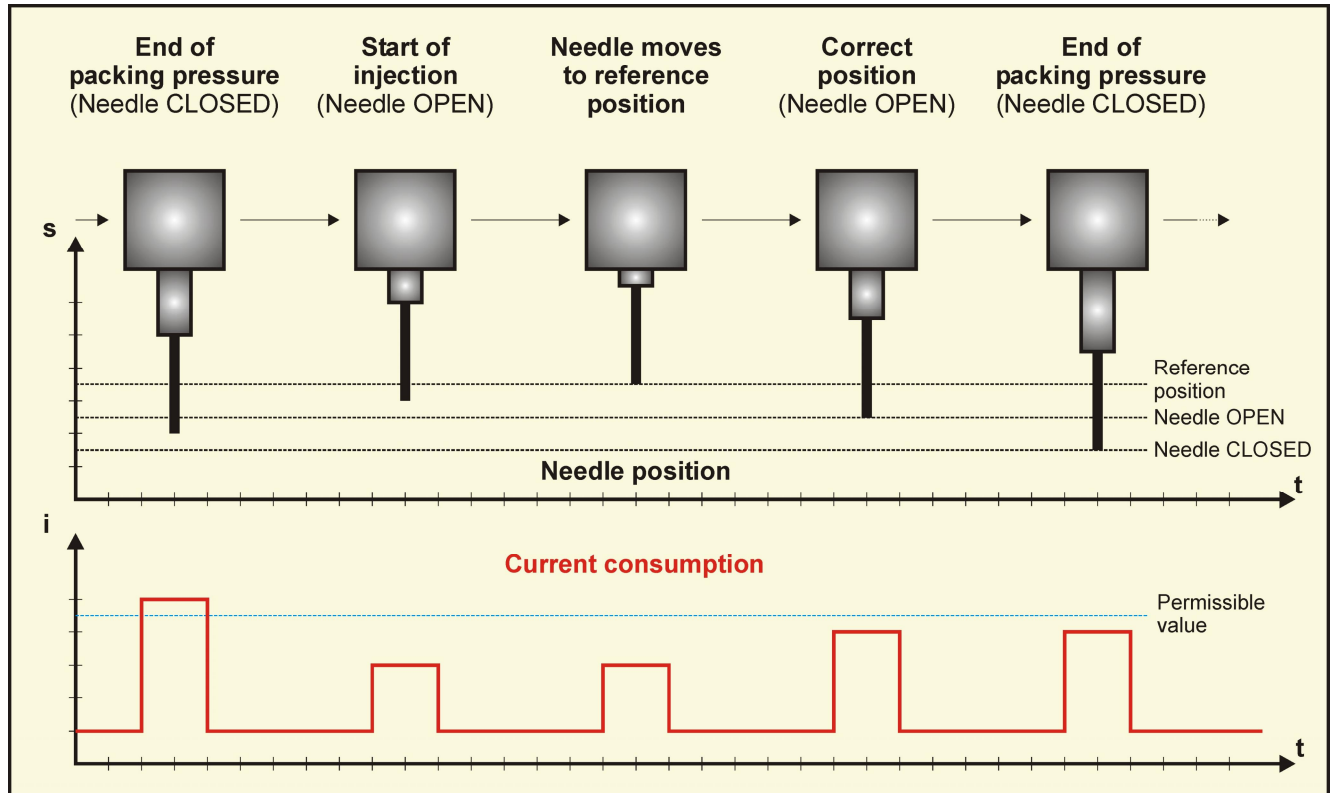
Manual reference trip

Under certain conditions it may be necessary to readjust the position of the needles. This may be the case e.g. after repair and maintenance work or after running tests in plastic that has not yet melted. To this end the control unit has a manual adjustment feature with which the drive units move to the rear mechanical limit stop in order to re-reference their positioning here and then move to their correct "CLOSE" reference position. Unlike the "reference run after error", this function simultaneously affects all the connected drive units. The function is triggered by pressing and holding the "CLOSE" button in "AUTOMATIC" mode first and then pressing the "OPEN" button.

Maintenance position

To enable maintenance or repair of the injection mould without damaging the needles they must be moved first from the "CLOSE" position to a rear position. To ensure the individual setup positions are not lost or do not have to be adjusted an additional "maintenance function" has been integrated in the control unit. With this function, all drives are simultaneously moved to the "OPEN" position, i.e. the tips of the needles are moved back by the set stroke. This ensures dismantling of the mould's contour plate without impairing the needles. This function is triggered by pressing the "OPEN" key in "AUTOMATIC" mode and keeping it pressed for at least 5 seconds. The needles simultaneously move to the required position and remain their, signalled by the lighting up of the "OPEN" LED. The "POWER"' LED then begins to flash. After flashing five times the "POWER" LED goes out and the control unit can be switched off, as no further functions are possible after this procedure. The next time the control unit is switched on the last position to be moved to is evaluated, if it differs from the "CLOSE" position, a closing movement of the needles is executed.


IMPORTANT: **The valve gate control unit should not be switched on until the hotrunner has reached its set temperature and the plastic to be processed has melted completely!**

Installation and operation of the PC program EDC

Each control unit is supplied with PC software for adjusting the control unit to the needs of the different systems and to adjust the signals to the capabilities and features of the injection moulding machine. This software runs under the current Windows versions and communicates with the control unit via an RS232 connection. A 9-pin subD cable is required to connect the computer to the control unit, pin wired to jack 1:1. The cable (product No. 60070.020) is included in the scope of supply. After setting the operating data correctly in the control unit, the PC can be removed and the control unit runs in stand-alone mode during production.

Installation

The program is supplied as a self-installing exe file, it is therefore very easy to install on a PC / laptop. If the file is run (double click or "Start – Run..."""), a directory is created on the computer and the required files are installed. Furthermore, an icon is created on the Desktop, in order to enable fast access to the program. After the program has been installed successfully it starts automatically. If the control unit is connected correctly, the interface used is registered and the following display appears on the screen showing the current operating data.
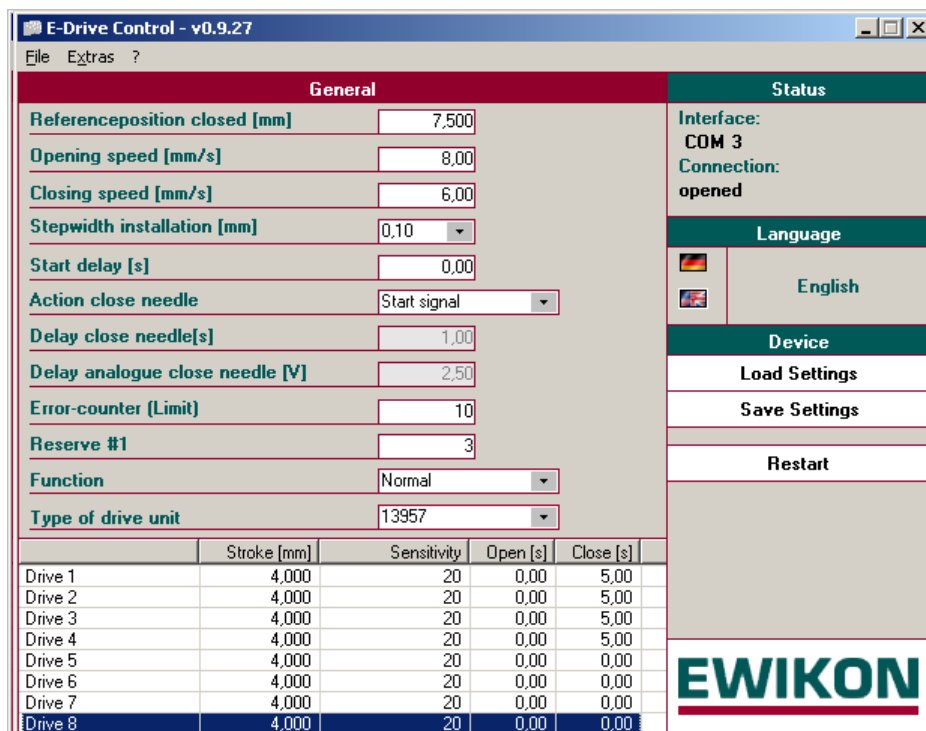
Default values for drives 13943 / **13957** [*)] / 13987	
*) condition as supplied	
Reference position CLOSED [mm]	5.500 / **7.500** / 9.500
Opening speed [mm/s]	8.00 / **8.00** / 10.00
Closing speed [mm/s]	6.00 / **6.00** / 8.00
Step width installation [mm]	0.10
Action close needle	Start signal
Stroke [mm]	4.000
Sensitivity	20

"General" view

All the adjustable parameters of the control unit are displayed in the left window with their current values, the functions are explained in detail in the following. The right window shows the used interface of the computer and the status of the connection, the software can be set to the required language (German/English) under the "Language" heading. Under the "Device" heading, the current settings can be read out of the control unit (Load settings), the changed values can be transferred from the computer to the control unit (save settings) or the control unit can be restarted (e.g. necessary after activating or deactivating drive units).

Settings are saved on the computer under the heading "File – Save as" and can be read again under "File – Open", furthermore, the communications logbook can also be viewed here.
Further information is available under the "Extras" heading, e.g. for problem analysis.

IMPORTANT: - **Changed settings do not become effective in the control unit until they have been saved!**

- **Due to operational processes the changes do not have any effect until the cycle after next!**

- **Due to operational processes the changes do not have any effect until the cycle after next unless the button ßRestart" is used!**

Reference position CLOSED
This value defines the common home position of all the drive units, at which the length of the needles is matched to the "CLOSE" position (mould gate closed). The information is given in mm as a distance to the rear mechanical limit stop of the drive unit. It is possible to adjust the distance to the front mechanical limit stop by a further 0.5 mm. If, for process reasons, all the needles have to be moved forwards or backwards by a certain value, this can be done using the "Reference position CLOSED". The adjusting range depends on the size of the drive unit used (needle diameter) as different maximum strokes are defined here.
- Needle diameter 1.5mm: Drive unit, item number 13943; maximum stroke   6.0mm; reference position 5.5mm
- Needle diameter 2.0mm: Drive unit, Item number 13957; maximum stroke   8.0mm; reference position 7.5mm
- Needle diameter 3.0mm: Drive unit, item number 13987; maximum stroke 10.0mm; reference position 9.5mm

OPENING speed and CLOSING speed
This parameter can be used to separately adjust the travel speed of the connected drive units for both directions: OPEN and CLOSE. The maximum force the drive unit can output during the movement and which acts on the needles is also dependent on the speed. Detailed information on the various variables is also provided by the "force – speed characteristic curves" on Page 15. Faster movement speeds can be set for smooth processes with simple materials in order to achieve shorted cycle times. Furthermore, a higher speed can be used to open the needles (= smaller force) than to close the needles (larger force required).

Set-up of step width
This is used to set the distance traversed by each step in the "SETUP" mode of the control unit. The values "0.10 mm" (default) or "0.05 mm", "0.02 mm" and 0.01 mm can be selected for finer resolution.

Start delay
This setting can be used to define a delay time for opening the needles and becomes effective after the "OPEN" trigger signal from controls of the injection moulding machine has been detected. This may be necessary for process reasons, if the injection moulding machine cannot provide a signal for the optimum opening time.

CLOSE needle procedure
This parameter is used to adjust the control unit for the electric valve gate to the available trigger signals from the controls of the injection moulding machine. Whereas a signal from the injection moulding machine is always required to start the cycle and the "OPEN needle" procedure, the closing of the needles ("CLOSE needle" procedure) can be triggered in various ways.

- *Start signal*   This is the easiest option, as only one signal is analysed. If the signal is applied, the needles are opened. If the signal is cancelled, the needles close again.
- *2nd signal (pulse)* The injection moulding machine provides two signal in pulse form. The first signal causes the needles to open, the second signal causes the needles to close.
- *Time delay*   The injection moulding machine only provides one signal in pulse form. If the signal is detected, the needles are opened, after the set delay time has expired (see "CLOSE needles delay time" parameter) the needles are closed again.
- *Analogue value*   The injection moulding machine supplies a signal for opening the needles, a measured value from an analogue transducer (e.g. screw position or pressure sensor in the mould) is analysed to close the needles. This option can only be used after consultation with EWIKON.

Please see page 14, "Flow charts" for the a.m. options

CLOSE needle delay time
This parameter is only effective, or rather can only be adjusted if the "time delay" setting was selected for the "CLOSE needle procedure" parameter. The set time expires when the needles reach their OPEN position.

CLOSE needle analogue value
This parameter is only effective, or rather can only be adjusted if the "analogue value" setting was chosen for the "CLOSE needle procedure" parameter. This setting is currently only available after consultation with EWIKON.

Error counter (limit)
This setting is used to specify when detected errors / faults from the position monitoring are reported by the control unit to the fault signal output. If the sum of the consecutive errors reaches the set value, the signal is activated. The default setting "10" therefore means that after 10 consecutive cycles with the detected position error a fault signal is sent. If the position has been corrected automatically beforehand, the error counter is reset.

Reserve #1
This mode has no function in the current standard version
(In special versions with 3 needle positions the offset of the 3rd position towards the "CLOSE" position is adjusted in increments of 0.1 mm here. Negative values mean offset towards OPEN, positive values mean offset towards CLOSE)

Function:

The basic mode of operation of the control unit is set here. The control unit needs to be switched off and on again (re-start) after an adjustment has been carried out and after the new selection has been saved for the change to become effective.

- "Normal":   All connected drives OPEN and CLOSE simultaneously. Delay times that might be set for the needles to OPEN and CLOSE have an effect on all drives. Needles close according to the selection made under "Action CLOSE needle".

- "Cascade":   A trigger signal initiates the injection cycle. Needles open with a time delay according to the individual setting "delay OPEN". After reaching "delay CLOSE" time all drives close again.

Needles can be closed simultaneously using the trigger signals like in the "Normal" mode of operation. The setting "Needle CLOSE" offers different versions:
- "Starting signal": Needles close upon decrease of the signal (signal 1 = 0)
- 2nd signal: The 2nd signal (impulse) causes the needles to close (signal 2 = 1)
- "Time delay": Needles close only after the set time delay.

Attention: **If "delay CLOSE = 0.00 s" is set, this causes the needles to close directly after they have opened (since this condition is fulfilled first). As this is normally not requested a value "Delay CLOSE > 0" always needs to be defined**

Type of drive unit
The connected drive unit type is displayed or can be adjusted here. The drive unit used depends on the model size of the valve gate nozzle and the needle diameter, as different forces are required to move the needles. 3 different sizes of drive units are available, see "CLOSE reference position" section.

The axis-specific data is set in a different input mask. Please double-click on one of the values to activate this mask.
.

Stroke
This parameter can be used to deactivate individual axes, e.g. if problems exist or if all possible connections of the control unit are not used. The axes are switched off with the setting "0.000mm", in this case, no stroke movement is triggered in the cycle and the needles remain in the ""CLOSE" position. When delivered, a stroke of "4.000mm" is set for all axes, different or deviating settings are possible if necessary.

Sensitivity
This value can be used to set the sensitivity of the fault detection of the current monitoring in order to react to process fluctuations or different material viscosities. Smaller values mean higher sensitivity, larger values make the monitoring less sensitive. When the control unit is delivered a mean value of "20" is set.

Delay OPEN
Individually settable delay time to open the needles in sequential operation (please see "Function")

Delay CLOSE
Individually settable delay time to close the needles in sequential operation (please see "Function")

"Locked variables" view

This view can be chosen under the "Extras" heading, here it is possible to read out information about the software version of the control unit, number of shots since the last switching on and total number of shots and various status and position data. Furthermore, information about the set offset of each axis (individual adjustment in "SETUP" mode) is available here. The information given on this page is mainly important for process monitoring and is therefore helpful for troubleshooting.

Version – software version of the control unit
Number of shots since power on – number of cycles since switch-on of the control unit
Total number of shots – number of cycles since start-up or change-over to a different drive type
Selected needle – position of the selector switch on the control unit
Error counter – number of consecutive opening or closing movements exceeding the current limit value
Status of needle positions – displaying whether the requested position is reached
Status of exceeded load values – displaying whether an error has been detected during the opening or closing movement
Status of active axes – displaying the drives that are switched on
Firmware – displaying the "operating system version" of the control unit
Offset – displaying the individual needle positioning resulting from the "set-up" operation
Error counter – number of detected excessive current during the last opening or closing movement
Position OPEN – position of drive from rear end stop with open needles
Position CLOSE – position of drive from rear end stop with closed needles
**3rd position**- position of drive from rear end stop for special function "3rd position"
Various – displaying modes of operation in case of cascade function

All further values not mentioned above are only required for the internal use of the control unit.
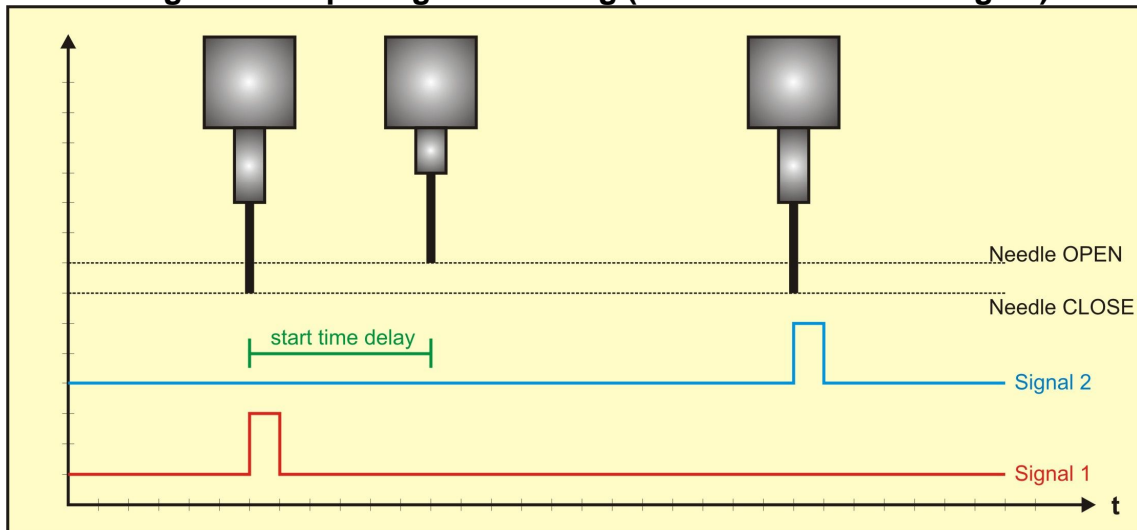
Using the pushbutton "Refresh" the current values are read out and displayed (e.g. new value for error counter after an opening or closing movement). This is carried out automatically by the function "interval" within the set time ("seconds").
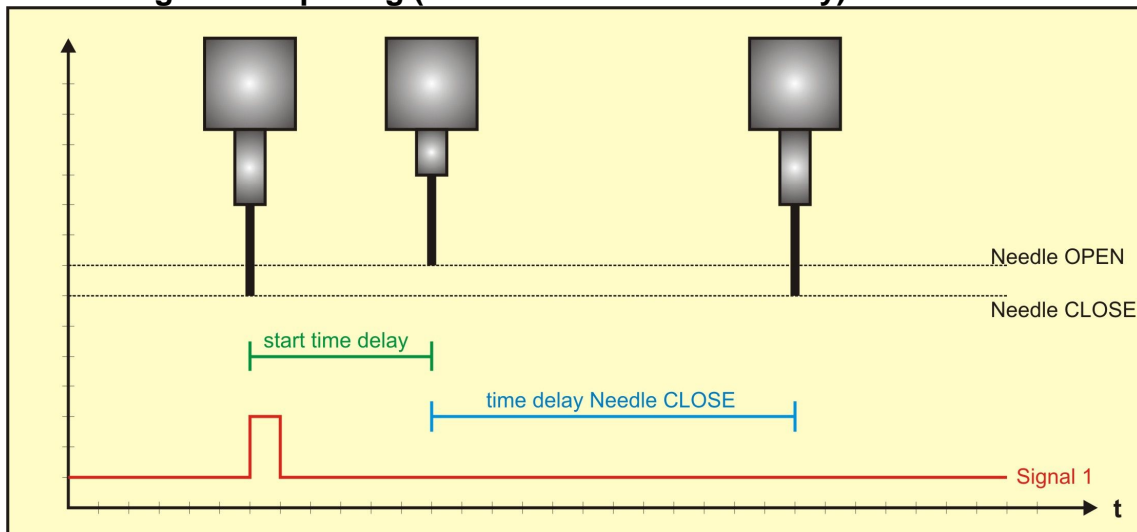
Flowcharts

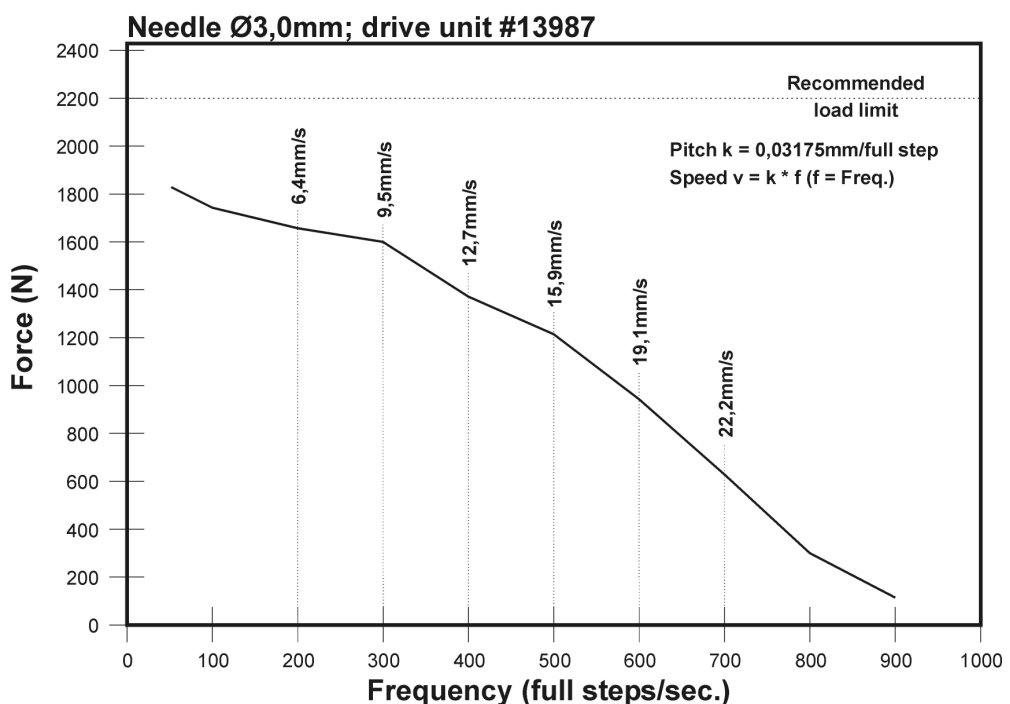## 1 Signal for opening and closing (needle CLOSE = starting signal)

Needle OPEN

Needle CLOSE

start delay time

Signal 1

t
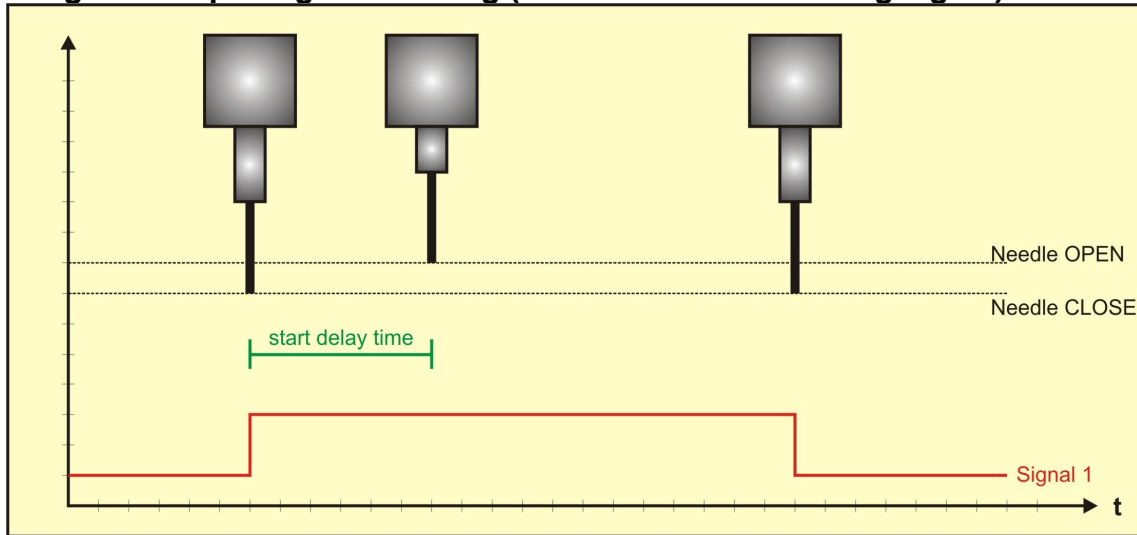
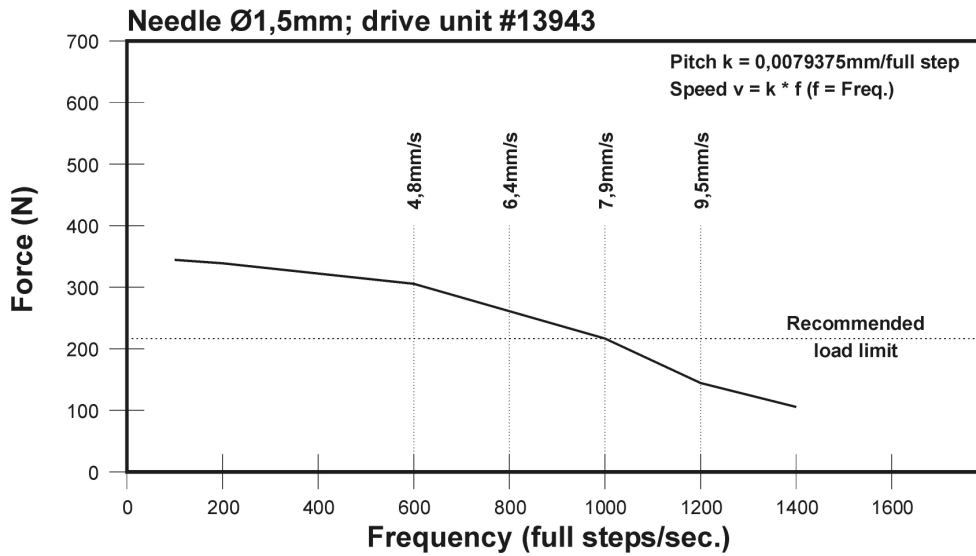## 2 Pulse signals for opening and closing (needle CLOSE = 2nd signal)

Needle OPEN

Needle CLOSE

start time delay

Signal 2

Signal 1

t

1 Pulse signal for opening (needle CLOSE = time delay)

Needle OPEN

Needle CLOSE

start time delay

time delay Needle CLOSE

Signal 1

t

Force-speed characteristic curves

Needle Ø1,5mm; drive unit #13943

Pitch k = 0,0079375mm/full step
Speed v = k * f (f = Freq.)

4,8mm/s 6,4mm/s 7,9mm/s 9,5mm/s

Recommended load limit

Force (N) — Frequency (full steps/sec.)

Needle Ø2,0mm; drive unit #13957

Pitch k = 0,010584mm/full step
Speed v = k * f (f = Freq.)

5,3mm/s 6,4mm/s 7,4mm/s 8,5mm/s 9,5mm/s 10,6mm/s

Recommended load limit

Force (N) — Frequency (full steps/sec.)

Needle Ø3,0mm; drive unit #13987

Recommended load limit

Pitch k = 0,03175mm/full step
Speed v = k * f (f = Freq.)

6,4mm/s 9,5mm/s 12,7mm/s 15,9mm/s 19,1mm/s 22,2mm/s

Force (N) — Frequency (full steps/sec.)

EWIKON
Heißkanalsysteme GmbH
Siegener Straße 35
35066 Frankenberg
Tel: (+49) 64 51 / 50 10
Fax: (+49) 64 51 / 50 12 02
E-mail: info@ewikon.com
www.ewikon.com

Your EWIKON partner:

EWIKON