

# *Operating manual/ menu items*

## **Motor control 6040 - FR**

### **Instruction sheet**



# **BELFOX**

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## 1. General information

All earlier versions lose their validity with this version.

The information in this document can be changed without previous notification.

This operating manual is specifically intended for the technical setter of the gate control 6040-FR.

The start-up of the control system may only be undertaken by electricians with recognized training who are familiar with the safety standards of electrical drives and automation technology.

**The safety instructions must be adhered to unconditionally!**

### 1.1 Symbol explanation



**Attention! :**

The following safety instructions must be observed unconditionally to prevent personal injuries.



**Warning! :**

The following safety instructions must be observed unconditionally to prevent property damage.



**Information:**

Additional information or a reference to other documentation is provided here.

### 1.2 Overview of revisions

The schedule describes the revisions conducted on this document, the particular reason for the revision and the revision date.

Revision	Date	Description, Reason
04	9. Jun. 2015	Further development of previous version (RSC)
05	3. Sep. 2015	SystemLog entries for problems with end switches Err. 171, 172 [Prog. Version 1.23a.23r.30] (RSC)

### 1.3 Terminology, definitions and abbreviations

<b>AC</b>	Alternating current
<b>BMZ</b>	Fire alarm panel
<b>CRC16</b>	16 Bit cyclic redundancy check)
<b>DC</b>	Direct current
<b>DIN</b>	Deutsches Institut für Normung
<b>EEPROM</b>	Electrical erasable programmable read only memory
<b>EMC</b>	Electromagnetic compatibility
<b>EN</b>	European standard
<b>FI</b>	Residual current circuit breaker
<b>FU</b>	Frequency converter
<b>GND</b>	Ground potential
<b>HW</b>	Hardware
<b>IP</b>	Protection type against foreign objects and water (intrusion protection)
<b>INDUS</b>	Inductive cable transfer system from the company ASO that replaces the towing cable for the transmission of the accompanying safety contact edges
<b>ISO</b>	Internationale Organisation für Normung (International Organisation for Standardization)
<b>LCD</b>	Liquid crystal display
<b>RAM</b>	Random access memory
<b>ROM</b>	Read only memory
<b>SKL</b>	Safety contact edges
<b>SW</b>	Software
<b>TÜV</b>	Technischer Überwachungsverein (Technical control board)
<b>VCC</b>	Positive operating voltage (voltage of common collector)

## 1.4 List of figures

- Figure 1: Overall view of the control unit
- Figure 2: Mechanical dimensions
- Figure 3: Current supply and motor connection
- Figure 4: connection of external devices
- Figure 5: connection of tested one-way light barrier
- Figure 6: connection of reflected light barrier
- Figure 7: Representative installation with limit switches, light barrier and safety contact strip
- Figure 8: connection relay with 24 V/DC
- Figure 9: connection relay with 230 V
- Figure 10: Layout and designation of the 7-segment LED
- Figure 11: Connection of a JCM radio transmission system for contact strips (untested)
- Figure 12: Connection of a JCM radio transmission system for contact strips (tested)
- Figure 13: wiring and jumper: JCM radio transmitter
- Figure 14: wiring and jumper: JCM radio receiver

## 2. Safety instructions



- Carefully read the operating instructions before putting then the gate control system into operation.
- The installation and start-up of the control system may only be conducted by specialised personnel that are familiar with the operating instructions and the applicable regulations on job safety and accident prevention. The instructions in these operating instructions must be followed and adhered to unconditionally.
- The operating instructions must always be available at the control system's site of operation. They must be thoroughly read and applied by every person who is tasked with the operation, maintenance and repair of the control system.
- The operators of the gate system or their representatives must be trained in the operation of the system after the system is started.
- Electrical work may only be completed by electricians.
- Safety regulations for electrical engineering and from professional associations must be followed.
- The manufacturer and user of the system/machine on which the control system is used are responsible for coordinating and adhering to all applicable safety regulations and rules under their own responsibility.
- The instructions in these operating instructions must be followed to guarantee function and safety. Bodily injuries or property damage may arise as a result of disregard of the warning instructions. The manufacturer is not liable for damages caused as a result of non-observance of the instructions.
- The control system does not contain any components that the user must service. Any warranty or liability on the part of the manufacturer is forfeited in the event of unauthorized modifications or repairs to the control system.
- The drive system must absolutely be removed from the power supply prior to wiring work. It must be ensured that the power supply remains interrupted during wiring work.
- All impulse transmitters and control devices for the gate must be mounted within view of the gate and at a safe distance from the gate's moveable parts. A minimum mounting height of 1.5 meters must be adhered to.
- It must be ensured that children cannot play with the gate control.
- Before the gate is moved it must be ensured that there are no people or objects in the gate's hazard area.
- All existing emergency command devices must be checked before starting the system.
- Reaching into a running gate or moving parts is never permitted.
- Possible crushing and shearing points on the gate system must be taken into consideration and if necessary protected.
- The control system guarantees functional safety, but not the safety of the entire system. Thus, a safety review of the entire system in accordance with DIN EN 13241-1 „doors and gates - product standard“ is necessary prior to use of the control system.
- The system must be checked for correct function in suitable intervals by qualified persons for the standard-conform design of the safety system in accordance with the standard DIN EN 12453 „Safety in use of power operated doors and gates“. The check must be documented in a way that allows it to be traced at any time.



**The gate control system 6040-FR is a frequency converter. There may still be dangerous voltages after shutdown due to loaded capacities. Thus, a waiting time of 5 minutes for the discharging of the capacities must be adhered to. There is *danger to life* with respect to live working on the frequency converter circuit board!**

**Only type B AC/DC sensitive residual current circuit breakers may be used if the control system is protected with a residual current circuit breaker.**

### **3. Function description and connections**

The present document is a description of the electrical gate control system 6040-FR of BELFOX Torautomatik GmbH. It contains the installation, operation, maintenance, repair, shutdown and disposal of the control system.

The 6040-FR is an electronic control unit with safety functionality. It is used as a control system for the operation of gates in the industrial environment. It contains a frequency converter and can operate a three-phase motor with up to 0.75 kW electrical power on a one-phase network. The frequency converter makes gate soft-start and braking possible. The maximum frequency transmitted by the converter is limited to a maximum of 75 Hz.

#### **3.1 Requirements**

The control system is only fully functional in the ready-to-use gate system. Additional external components may also be required, for example:

- Drive (electric motor and transmission)
- Command input devices (switch/button)
- Signal devices (blinking lights/horns)
- Sensor elements (Safety edges/light barriers)

These are not included in the control system's scope of delivery.

#### **3.2 Technical characteristics**

The 6040-FR has the following characteristics:

- Auto-configuration and comprehensive default settings for standard gate systems
- Comprehensive parameterization system
- 2 inputs for the deadman operator buttons OPEN and CLOSE
- 4 inputs for the automatic control device STOP, OPEN, PartialOPEN and TOGGLE switching impulse (OPEN, STOP, CLOSE, STOP,...)
- 2 inputs for the gate end switches OPEN and CLOSE
- 3 output relays (make contacts) for blinking light, gate position OPEN and position CLOSED, Motor brake, maintenance requirement
- 2 output relays (make contacts) for blinking light, gate position OPEN and position CLOSED, motor brake, maintenance requirement
- INDUS and SENTIR *edge* inputs can be connected via screw terminals, for the evaluation of the moving and fixed safety contact edges
- Separate input for light barrier
- Operation and configuration via rotary and selection switch
- 7-segment display for status reports
- Optional removable LC display for diagnostic display and parametrization via menu navigation
- Optional radio receiver for hand-held radio transmitters for remote control of the gate

### **3.3 General view of the control system**

An overview of the relevant parts is provided in the general view shown of the control system; they are also referred to in the text of these operating instruction.

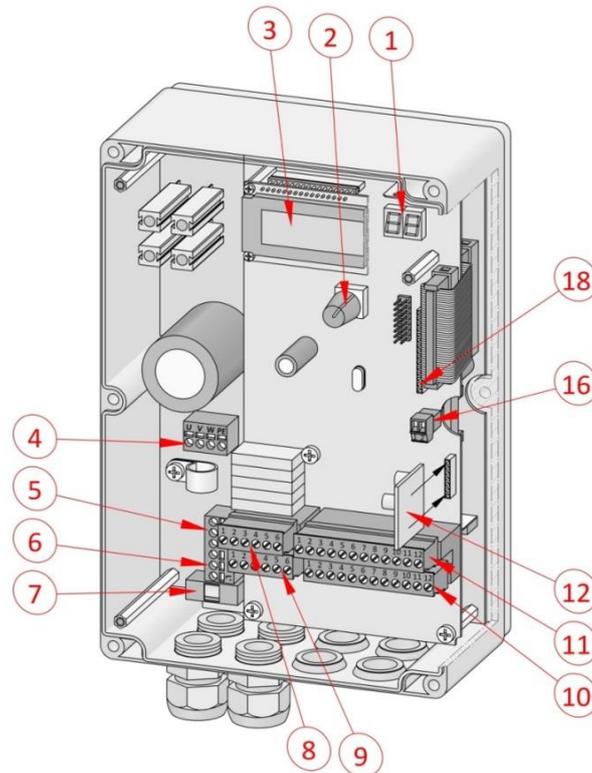


Figure 1: Overall view of the control unit

#### **Designations:**

- 1: 7-segment display (below the LC display)
- 2: Rotary and selection switch to select display and for settings
- 3: LC text display
- 4: Motor connection
- 5: 230 V AC / 50 Hz Power supply connection
- 6: Connection for additional 230 V AC / 50 Hz loads
- 7: Fuse for the external 230 V loads (6,3 A) on terminal 6
- 8: Connections for the Rel4 and Rel5 relay outputs
- 9: Connections for the Rel1 to Rel3 relay outputs
- 10: Connection for the power supply of the external 24 V DC devices and operating elements as well as for the immobile safety contact edges
- 11: Connections for the inputs for the control device, light barrier and INDUS core
- 12: Electrical evaluation device for the accompanying safety contact edges: ISK7 ATC circuit board
- 16: Aerial connection of the receiver for the radio remote control (optional)
- 18: Slot for radio receiver module (optional)

### **3.4 Operating modes: Function and operation**

The controller software is subdivided into individual function modules and is depicted for the user in two possible operating modes (deadman operation and automatic operation).

#### **3.4.1 Deadman operation**

The gate control system can be used in deadman operation with limited comfort. In deadman operation the gate can only be moved with the OPEN and CLOSE buttons specifically connected to inputs ,In8' and ,In7'. The gate

does not require any safety contact strips for this operation. The gate is only in operation for as long as the open or close button is pressed. Deadman operation is only permitted, if the user has full visual contact with the gate system. Even in deadman operation mode a STOP button is to be provided for in addition to the OPEN and CLOSE buttons. If this button is not to be connected, the relevant input must be connected by a wire bridge with +24 volts. The control system also automatically switches out of automatic operation to this operating mode if the safety devices on the gate do no longer permit automatic operation (e.g. defective safety edges / light barrier). In this case the operator must also keep the command button (OPEN [In8] or CLOSE [In7]) continuously pressed. The gate movement will only be initiated with a delay of 2 seconds. This is a safety feature and serves to signal the operator the transition from automatic mode to deadman operating mode.

### **3.4.2 Automatic operation**

The control system is normally operated in this automatic mode when safety is completely established. All of the control system's functions are only available to the user in automatic operation. Here, the gate's complete safety is guaranteed by the activated safety devices.

In automatic operation a gate movement can be initiated by:

- deadman button OPEN or CLOSE
- Control device (OPEN or PartialOPEN)
- Impulse button with TOGGLE function (OPEN, STOP, CLOSE, STOP)
- Commands via radio remote contro

Every command results in the execution of the complete, selected action (open gate, close gate, etc.). Every action is immediately ended with a stop command or a signal from the safety devices.

Activation of the safety contact edges results in an immediate, complete reversal of the gate. An interruption of the light barrier during the closing operation also results in the gate opening.

A movement command for the opposite direction of the current movement gently brakes the gate and then makes it move in the opposite direction.



#### **Automatic operation with incomplete setup:**

If the gate has not yet been completely set up or if the control system's reference run has not yet been concluded, the control system run in a special safety mode (example: The gate's end positions have not yet been detected in the reference run).

The gate then only moves at a slower speed. The automatic speed is not used until after the test run with slow speed.

Even if the drive unit was electrically voltage-free, the gate only moves at slow speed at first until an end position has been reached.

### **3.4.3 Automatic change of the operating modes**

In the event of the failure of electronic safety devices on the gate (e.g. defective safety edge or light barrier), the control system can automatically switch from automatic operation to deadman operation. This automatic change is only made for an initiated motor movement and only in the event of activation of the button intended for deadman operation. Subsequently, the control system reassumes automatic operation; however, it can switch back to deadman operation in the event of a renewed or persistent defect during the next run.

A change between the operating modes is possible in the following directions:

- Automatic operation → deadman operation
- Deadman operation → automatic operation (if safety has been re-established)

## **3.5 Connectable auxiliary equipment**

The gate control system 6040-FR can be operated with one or more of the following components:

**Safety contact edges** Safety contact edges with an 8.2-kOhm load resistance for the open and close direction can be connected directly over clamping units (Image 1: General view no. 10).

## ISK-System

The control unit already contains the control and evaluation logic for the inductive safety system ISK for the monitoring of travelling safety contact edges (8.2 kOhm). The ISK 7 ATC circuit board is attached to the control system for this purpose (figure 1: General view No.12. On a terminal (figure1 General view No.11) you can directly connect the immobile core SPK 55.

## Light barriers

One-way light barriers or reflected-light barriers can be connected on a separate input (figure 1: General view No. 11).

## Radio receiver

The control system can optionally be equipped with a receiver for hand-held radio transmitters for remote control of the gate. An externally mounted aerial can then be connected to said receiver on a separate terminal (figure 1: General view No. 16).

## 4. Installation

This chapter deals with the start-up of the 6040-FR.

### 4.1 Control system assembly



#### Warning!

- The control system must be checked for any transport or other damages prior to assembly!
- Touching electronic parts, in particular the processor circuit parts, must be avoided.

Electronic parts can be damaged or destroyed by electrostatic discharges.

- The system must be kept at zero-potential during the assembly of the control system.
- The control system must be assembled in a way that is mechanically free of distortion.
- Unused cable entry points must be replaced with sealing plugs in order to guarantee the housing's safety class.
- The cables may not be exposed to any mechanical tensile loading.
- If the control system is assembled on a conductive surface, this surface must be connected to PE with an adequate ground wire connection. The control system's cooling element **does not** constitute such a ground wire connection on its own.

The control system is mounted using four cylinder head screws with a diameter of 4 mm. The control system is intended for vertical mounting.

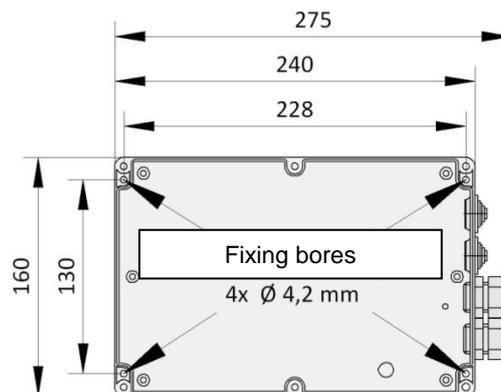


Figure 2: Mechanical dimensions

**Note:** The control system's cooling element warms up during operation. Thus, adequate thermal coupling of the cooling element must be taken into consideration. A form-fitting connection of the cooling element with a heat-dissipating metal surface is ideal. The mounting of the control system on a flammable surface (e.g. wood) is not permitted.

With regard to non-heat-dissipating surfaces, the control system must be mounted with clearance with distance bolts. Air space of at least 10 cm must be planned above and below the control system for convection. Insufficient heat dissipation can negatively impact the control system's function.

In the event of continuous operation, the cooling element can reach up to 65°C. The frequency converter turns itself off at higher temperatures.

## 4.2 Electrical connection



### Attention!

For safety reasons, electrical installation must always be completed by an authorized electrician. Work on the control system is only permitted with all-pole disconnected power. A power cut-off switch or the use of a plug must be planned for all-pole disconnect. The power cut-off switch or the power plug must be easily accessible.

The points listed in the Safety Instructions section (chapter: 2) must be observed.

The parallel routing of signal and energy lines should be avoided to the greatest possible extent.

All lines should be assessed according to their power consumption.

The graduated nipples used in the housing may only be opened wide enough that the protection against water and foreign objects still corresponds to the IP class once the lines have been fed through.

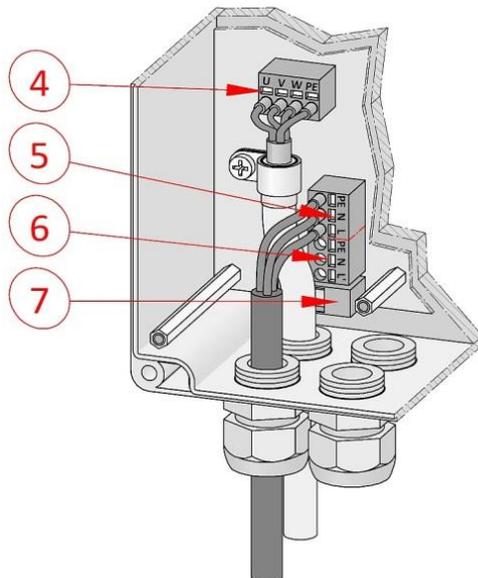
Damaged cable feedthroughs must be replaced immediately with undamaged ones.

### 4.2.1 Power supply and drive motor connection

The 6040-FR is designed for a one-phase input voltage of 230 V AC and generates a rotating field of 3 x 230 V AC. The supply voltage is connected to the lower power board via the terminals labelled with „L“, „N“, and „PE“ (figure 3 No. 5).

The three-phase motor occupies the terminals „U“, „V“, „W“, and „PE“ (figure 3 No. 4). When connecting the motor itself, the motor manufacturer's connection plans must be observed.

Absolutely ensure the correct connection of the protective earth conductor and the motor connection cable.



- 4 - Three-phase motor connection
- 5 - Voltage supply 230 V
- 6 - External 230 V consumers
- 7 - Microfuse for external consumers (6.3 A delay)

Figure 3: Power supply and motor connection

When starting the gate system, the motor's direction of rotation must be taken into consideration so that the gate also moves in the desired direction when the OPEN button is activated. If necessary, the motor connections „V“ and „W“ must be exchanged or the motor's direction of rotation must be changed per software via the configuration in the menu.

### 4.2.2 Instructions for suitable EMC installation



### Attention!

Damage to other devices in the immediate vicinity of the control device may occur in the event of unsuitable EMC installation.

The 6040-FR is a frequency converter control system. Frequency converters are devices that can generate electromagnetic interferences in your surroundings due to their circuitry. Thus, only a shielded line can be used as a motor line. The shield must be connected to the motor via an EMC screw connection and in the control system to the intended PE clamp.

#### **4.2.3 Supply for external consumers with 230 V AC**

External consumers for the control system that work with 230 V AC power supply can be connected via the secured voltage output with the terminal designation „L“ on the control system’s power board (figure 3 No. 6.) The maximum load, determined by the integrated safety fuse (figure 3 No. 7) must be observed in the process.

#### **4.3 Input and output wiring**

There are two terminal blocks for the connection of external devices arranged next to one another on the control system. The left block is intended for relay outputs (figure 1: General view No.: 9), while control devices and sensors can be connected on the right block (figure 1: General view No.: 10 and 11). The terminal designation is printed on the board below the terminals.

Said terminals are also shown individually in figure 4 below for better identification.

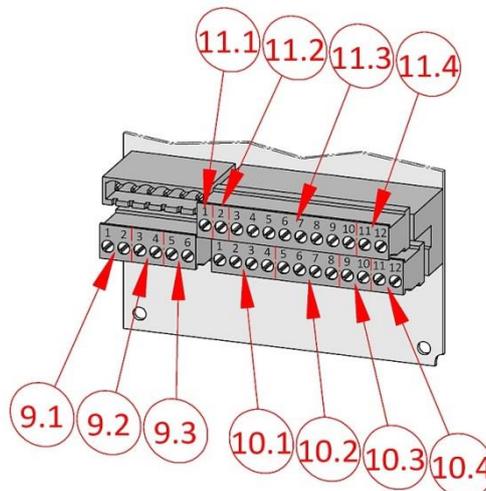


Figure 4: Connection of external devices

#### **4.3.1 Power supply for external devices with 24 V DC**

An isolated and voltage-stabilized 24 VDC power supply that can supply a maximum 500 mA current is provided in the control system for the power supply for external devices, control devices and sensors. This supply voltage is protected on the circuit board with a fuse with automatic reset. The 24 volts are available on the lower terminal strip (Image 4 No. 10.1) on the left contact points No. 10.2) with the designation „0V“.

Image No.	Terminal No.	Designation	Function
10.1	1 to 4	+24 V	+24 Volt DC power supply
10.2	5 to 8	0 V	Ground potential for external 24 V consumers

#### **4.3.2 Connection of the control devices and end switches**

The inputs for the control devices and control system are marked on the upper terminal strip with „In1“ to „In8“ (figure 4 No. 11.3) and assigned the following functions:

Image no.	Term. No.	Design.	Input function
11.3	3	In8	Deadman button OPEN (e.g. key switc button on gate)
11.3	4	In7	Deadman button CLOSE (e.g. key switch button on gate)
11.3	5	In6	STOP button (break contact)
11.3	6	In5	OPEN impulse
11.3	7	In4	PartialOPEN impulse (pedestrian passage)
11.3	8	In3	TOGGLE switching impulse (OPEN/STOP/CLOSE/STOP)
11.3	9	In2	End switch for OPEN position (break contact)
11.3	10	In1	End switch for CLOSE position (break contact)

Buttons with make contact are connected as control devices for the open, close and switching impulse functions (toggle). For the functions OPEN [In5] or PartialOPEN [In4], a switch with a static make contact is also possible (e.g. timer) to keep the gate open.

Only control devices with a break contact are used for the STOP function. Multiple openers can be switched in series one after the other in the form of a stop chain.

The end switches for the gate's OPEN and CLOSE position are also break contacts.

The two coloured input functions represent the version 1. In 6.3.5 is described how different functions can be allocated to these two inputs.

Both of the input functions shown in grey in the table constitute variant 1. Section 6.3.5 contains a description of how both of these inputs can also be assigned other functions.

In order to fulfill the special requirements for deadman operation, the „In7“ and „In8“ inputs may only be allocated to buttons the operation of which always guarantees complete view of the gate system and risk-free use.

#### **4.3.3 Immobile safety contact edges**

The immobile safety contact edges (8.2 kOhm) for protection of the gate can be directly connected to the pluggable terminals on the bottom right of the input terminal block. Terminals 9 and 10 are marked with SKL open (figure 4 no. 10.3) on the conductor board. Here, the edge can be connected in the gate's OPEN direction.

11 and 12--which are marked with „SKL close“--are for the connection of the safety contact edge in the CLOSE direction (figure 4 No. 10.4).

Image no.	Terminal no.	Designation	Input function
10.3.	9,10	SKL open	Immobile safety contact edges OPEN (open direction)
10.4	11,12	SKL close	Immobile safety contact edges CLOSE (close direction)

The evaluation of the signals of the contact strips is effected in the control unit's software.

#### **4.3.4 System connection item no. 620-3**

The evaluation of the inductive cable transfer system item no. 620-3 for the accompanying safety contact edges on the gate (8.2 kOhm) is already integrated in the control system if the ISK7 ATC circuit board (figure 1: General view No. 12) is already inserted. The immobile core SPK55 can be directly connected to both of the right terminals no. 11 and 12 up on the input terminal block with the designation ISK (figure 4 no. 11.4).

The signals for the accompanying safety contact strips are subsequently safety-evaluated in the control system.

Figure No.	Terminal No.	Designation	Input function
11.4	11, 12	ISK	ISK input (immobile core)

#### **4.3.5 Light barrier connection**

Through-beam light barriers as well as reflected-light barriers that work with 24 V DC operating voltage can be directly connected to the control system.

The light barrier's input signal is connected to terminal No. 2 with the designation „LB in“ (figure 4 no. 11.2).

Figure no.	Terminal no.	Designation	Input function
11.2	11, 12	LB in	Light barrier input signal

The upper left clamp no. 1 with the designation „24V  $\overline{\square}$ “ (figure 4 no. 11.1) is a 24 volt supply that is briefly shutdown every 5 minutes for testing purposes. A light barrier's transmitter, for example, can be connected to this voltage supply. The light barrier's input signal function is checked during the brief shutdown phase.

The different connection between a through-beam light barrier tested by blanking the transmitter and an untested reflected-light barrier is shown in an example in the following two images:

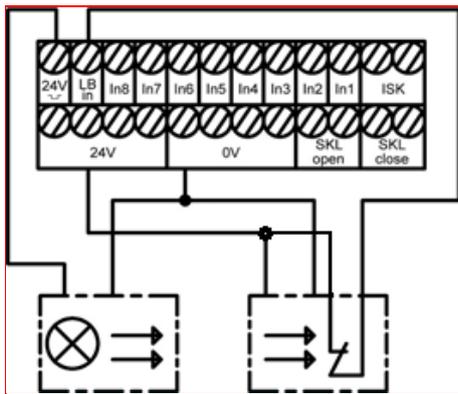


Figure 5: Connection for tested through-beam light barrier

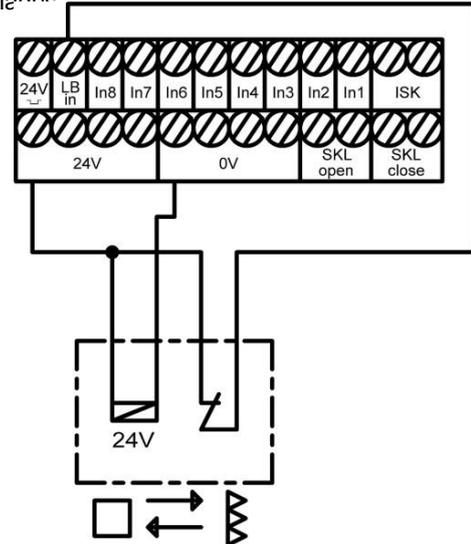


Figure 6: Connection for reflected-light barrier

#### 4.3.6 Overview of input installation plan

The 6040-FR is configured for operation with end switches. The connection for the control devices and sensors to the inputs is shown in a typical configuration in the following drawing:

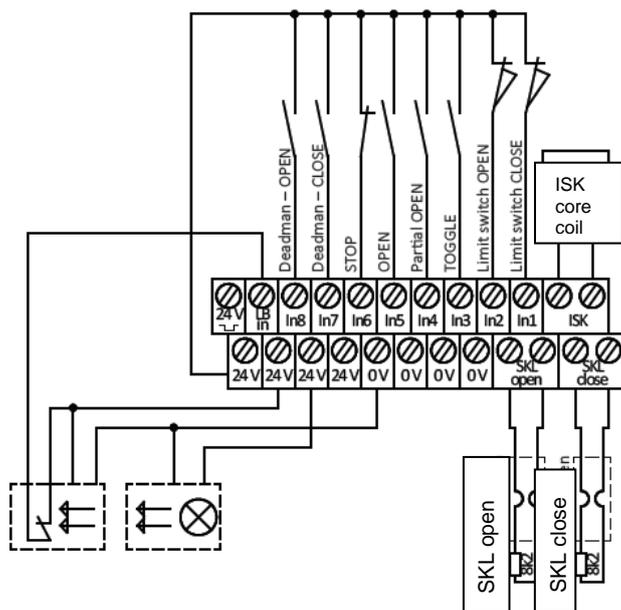


figure 7: Example installation with end switches, light barrier and safety contact edges

## 4.4 Relay output wiring

The 6040-FR provides three relays with make contacts for signalling and lighting purposes. The switching contacts are potential-free and can switch ohmic loads of maximum 250 W. The relays are preset with the following functions:

Figure no.	Terminal no.	Design	Output function
9.1	1, 2	Rel1	Blinking or all around light
9.2	3, 4	Rel2	status display gate OPEN
9.3	5, 6	Rel3	Status display gate CLOSED

The output of Rel1 (figure 4, no. 9.1) with the warning light function is permanently switched on with the beginning of the pre-warning time and during the gate movement. The blinking function has to be effected by the connected lamp.

The service engineer can configure the following functions onto the relays Rel2 (figure 4 no. 9.2) an Rel3 (figure 4 no. 9.3):

- Lighting (courtyard light) with shutdown delay after the end of the gate movement
- Maintenance signal (maintenance required)
- Additional electrical brake
- error indication



**Warning:** When assigning the functions to the individual relays it is necessary to ensure that the outputs are not doubly configured. An output that has already been configured must first be released from its previous function before it can be assigned another function.

### 4.4.1 Relay outputs with 24 V DC or with 230 V AC

Control lamps with 24-volt supply voltage can be connected as shown in the following figure 8.

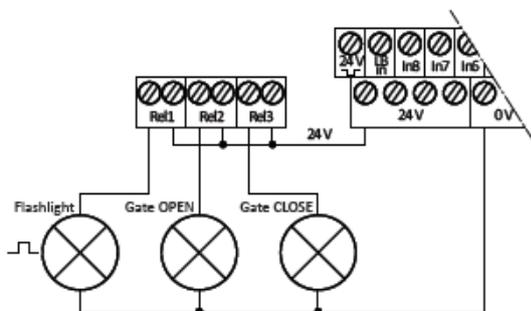


Figure 8: Connection of relay with 24 V DC

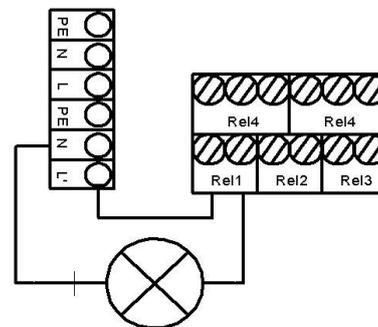


figure 9: Connection relay with 230 V



**Warning:**

The control system's maximum current capacity of 500 mA must be taken into consideration when wiring the external 24 V supply.

There is a 230 V output for external consumers on the control system's power board (figure 3 No. 6) that is protected with a glass tube fuse (6.3 A delay) (figure 3 No.7). 230 V consumers can also be switched via this supply output and the relays. The connection of a corresponding control lamp or blinking lamp can thus be established as shown in figure 9.



**Warning:**

The supply output's maximum current capacity must be taken into consideration during wiring. Furthermore, the maximum load of 250 W must be observed for each individual relay.

The fuse (6.3 A delay) may only be replaced with a fuse with the same connection value.



**Caution:**

The relay outputs are separated from the safety extra-low voltage in the control system in a way that conforms to standards. However, the individual relay connections amongst themselves do not fulfil this requirement.

**Therefore a mixed operation of the connection on the 230 V AC and 24 V DC relays is not permissible (either all 230 V AC relays or all 24 V DC relays).**

#### 4.5 Connection of the radio receiver and an aerial

The control system can optionally be equipped with a radio receiver 784 for remote control of the gate. The radio receiver operates with 868 MHz and AM modulation. The radio receiver is factory-fitted onto the female connector strip to the right of the slot for the communication interface (figure 1: General view No. 18).

On this receiver, an external aerial can be connected to the terminal directly below the module (figure 1: General view No. 16).

**The inner conductor of the coaxial cable from the aerial is connected to the right-hand terminal no 2 (facing the casing). The shielding of the aerial cable is connected to the left-hand terminal no. 1 (to the centre of the board).**



**Information:**

Only hand-held transmitters released by the manufacturer can be trained by the control system.

### 5. Operating elements and displays

Entries in the installed software of the control system are made via a modern one-button operating element, the rotary and selection switch. Visual responses from the program to the operator are made via the liquid crystal display (LCD) and the 7-segment display (LED).

#### 5.1 Rotary and selection switch

The control system display can be influenced using the rotary and selection switch (figure 1: General view No.: 2). The control system's parameterization can also be activated via said rotary and selection switch with the help of the integrated menu system. This operating button has two functions. By rotating, the size of a displayed value can be changed: to the right (clockwise) increases; to the left (counter-clockwise) reduces. It is also possible to move backward and forward in a displayed table or a memory area by rotating.

By pressing the button down another mode is selected, or a display or selection (menu) is quit.

#### 5.2 LCD display

A mountable LC display with 2 rows that each have 16 characters is intended in order to be able to display comprehensive information from the control system (figure 1: General view No.: 3). For example, the respective active operating mode or the motor movement status (open, close) of the control system is shown on the display in plain text.

BeIFox6040-FR Automatikbetrieb
-----------------------------------

The display's background lighting is active as long as entries are made via the rotary and selection switch. The lighting goes out 20 seconds after the last actuation. However, it can be switched back on at any time by rotating the selection switch.



**Information:**

The display's lighting blinks for a few seconds after the control system is switched on or after a software reset. This signals the program's start process.

##### 5.2.1 Depiction of operating modes

The following displays are possible in the LCD display's depiction of the operating modes:

Display	Meaning
ATC150 Pe:x.xx	Start display for the peripheral controller (during synchronization with the motor controller)
BelFox6040-FR Automatikbetrieb	Automatic operating mode gate is in non-operating state
Automatikbetrieb Oeffnen	Automatic operation; Open gate active
Automatikbetrieb Schliessen	Automatic operation; Close gate active
Automatikbetrieb Sofort Stopp	Automatic operation; STOP active
Automatikbetrieb Schliessen: XX	Automatic operation; gate closes automatically after expir. of xx seconds
BelFox6040-FR Totmannbetrieb	Deadman operating mode idle state
Totmannbetrieb Oeffnen	Deadman operation, open gate active
Totmannbetrieb Schliessen	Deadman operation, close gate active
Totmannbetrieb Sofort Stopp	Deadman operation, stop active

### **5.2.2 LCD sensor depiction**

Detailed information on the configured sensors is also possible with the help of the display. The current status of the configured sensors is listed by pressing the rotary and selection switch. The individual sensors are shown sequentially by rotating the switch.

The respective sensor from the parameter list is specified in the first row.

The sensor's current status is displayed in the second row. Here, a „1“ represents an active sensor, while a „0“ represents an inactive one. These displays are constantly updated and facilitate easy troubleshooting. These displays are also overwritten with the depiction of the operating modes 60 seconds after the last actuation of the rotary switch.

Sensors that are not installed (specified by parameters in the program) are also not shown.

Display	Meaning
Sensoren Anfang	The first entry in the sensor table is made by rotating the selection switch to the left
EndschalterAUF Wert: 2 => x	Current value of the end switch for the gate's open direction
EndschalterZU Wert: 1 => x	Current value of the end switch for the gate's close direction
Stat.LeisteAUF Wert: 1 => x	Immobile safety contact edge for the gate's open direction
Stat.LeisteZU Wert: 1 => x	Immobile safety contact edge for the gate's close direction
Mitf.LeisteAUF Wert: 1 => x	Accompanying safety contact edge for the open direction (INDUS)
Mitf.LeisteZU Wert: 1 => x	Accompanying safety contact edge for the close direction (INDUS)
Lichtschanke Wert: 1 => x	Status of light barrier
Sensoren Ende	The last entry in the sensor table is made by rotating the selection switch to the right

### 5.3 7-segment display

Two 7-segment LED displays are arranged next to each other on the control system's circuit board under the optional LC display (figure 1: General view No.: 1). This display can either depict the operating mode or the status of the connected sensors.

It is possible to switch between the operating mode and sensor depiction display modes by briefly pressing the rotary and selection switch.

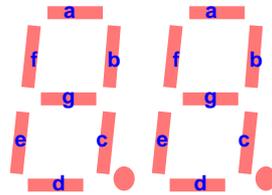


Figure 10: set-up and designation of the 7-segment LED

#### 5.3.1 Depiction of the operating modes for the 7-segment LEDs

The following displays are possible in the depiction of the operating modes:

Display	Meaning
-.-	Start display for peripheral controller (wait for synchronization between the controllers)
oo	Deletion and initialization of the parameter memory
Ld	Request for loading/saving the parameters
Au	Automatic operating mode idle state
dE	Deadman operating mode idle state
OP	Open gate active
CL	Close gate active
St	STOP active
99 - 1	Seconds – countdown if an automatic supply is active

#### 5.3.2 LED sensor depiction

The possible connected safety edges and light barriers are depicted with the individual LED bars in the sensor depiction display mode (briefly press the rotary and selection switch). The following list shows the allocation of the bars to the connected input sensors:

##### o Left display

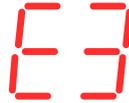
- Segment a: Light barrier
- Segment g: End switch CLOSE
- Segment f: Safety contact edge for the „Close“ direction
- Segment e: ISK for the „Close“ direction

##### o Right display

- Segment a: Light barrier
- Segment g: End switch OPEN
- Segment b: Safety contact edge for the „OPEN“ direction
- Segment c: ISK for the „OPEN“ direction

The respective bar **lights up** when the assigned sensor input is **not active**. If one activates the sensor, the corresponding bar extinguishes.

The 7-segment display looks like this if none of the connected sensors are active:



## 5.4 Information on menu display

The menu system for 6040-FR can only be reached when the display is mounted. The menu selection can be found by means of the rotary and selection switch. This offers the following options:

### Menu:

#### 1. Identification

- |                     |                                                                  |
|---------------------|------------------------------------------------------------------|
| • General version   | Installed program versions                                       |
| • Gate version      | Control variant                                                  |
| • Serial number     | Individual serial number of the control system and PAN           |
| • Motor controller  | Program version of the motor controllers                         |
| • Peri.controller   | Program version of the periphery controller                      |
| • Parameter set     | Version of the installed table of parameters                     |
| • Boot loader motor | Version of the boot loader program from the motor controller     |
| • Boot loader peri. | Version of the boot loader program from the periphery controller |

#### 2. Service access

- |                            |                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------|
| • Password entry           | Access (password) for service technicians and activation of other or additional performance characteristics |
| • National language        | Selection of a different display language in the LC display                                                 |
| • Motor rotation direction | Change of the motor direction of rotation left/right                                                        |
| • Motor speed              | Selection of the maximum motor speed in automatic mode                                                      |
| • PWM boost                | Increase of voltage at now no. of revolutions                                                               |
| • Par.reload               | Resetting the adjustable parameters to their factory settings                                               |

#### 3. Diagnostics

- |                   |                                                                                                   |
|-------------------|---------------------------------------------------------------------------------------------------|
| • Gate status     | State of control system/gate, inputs and outputs as well as of maintenance information            |
| • Sensor status   | Setting and state of connectable sensors                                                          |
| • System log book | Table of the most recent events and faults                                                        |
| • Event log book  | Table of the events (and faults) which have occurred since the last restart of the control system |
| • Temperatures    | Display of the temperatures of the computer and the power electronics                             |

#### 4. Settings

- |                      |                                                                         |
|----------------------|-------------------------------------------------------------------------|
| • Set timer          | Menu for setting various timers (autom. run times, lighting etc.)       |
| • Input: In3/4       | Selecting the functions on inputs In3 and In4                           |
| • Safety             | Selection of the installed safety sensors on the gate                   |
| • Special parameters | Settings for maintenance requirements and external electric motor brake |
| • Operating mode     | Selection between deadman operation and automatic operation             |
| • Status report      | Settings for status and fault reports as relay output                   |

#### 5. Radio remote control

- |                            |                                                                                                    |
|----------------------------|----------------------------------------------------------------------------------------------------|
| • Active transmitters      | Display of the number of trained radio transmitters                                                |
| • Training transmitter UMS | Training new hand-held transmitter (button) for the switch-over impulse function (toggle)          |
| • Training transmitter AUF | Training new hand-held transmitter (button) for the function OPEN                                  |
| • Training transmitter ZU  | Training new hand-held transmitter (button) for the Close function                                 |
| • Training transmitter     | Training new hand-held transmitter (button) for the part. Open function Part. (pedestrian passage) |

- Delete transmitter      Delete an already trained and saved hand-held transmitter (button) by a renewed reception
- Delete transmitter entry      Delete a hand-held transmitter (button) from the table listed
- Delete all      Delete all trained hand-held transmitters (buttons)

### 5.4.1 Menu system selection

From the operating mode display you get to the menu system for the control system by pressing the rotary and selection switch for appx. two seconds. The text „main menu“ then appears on the display.



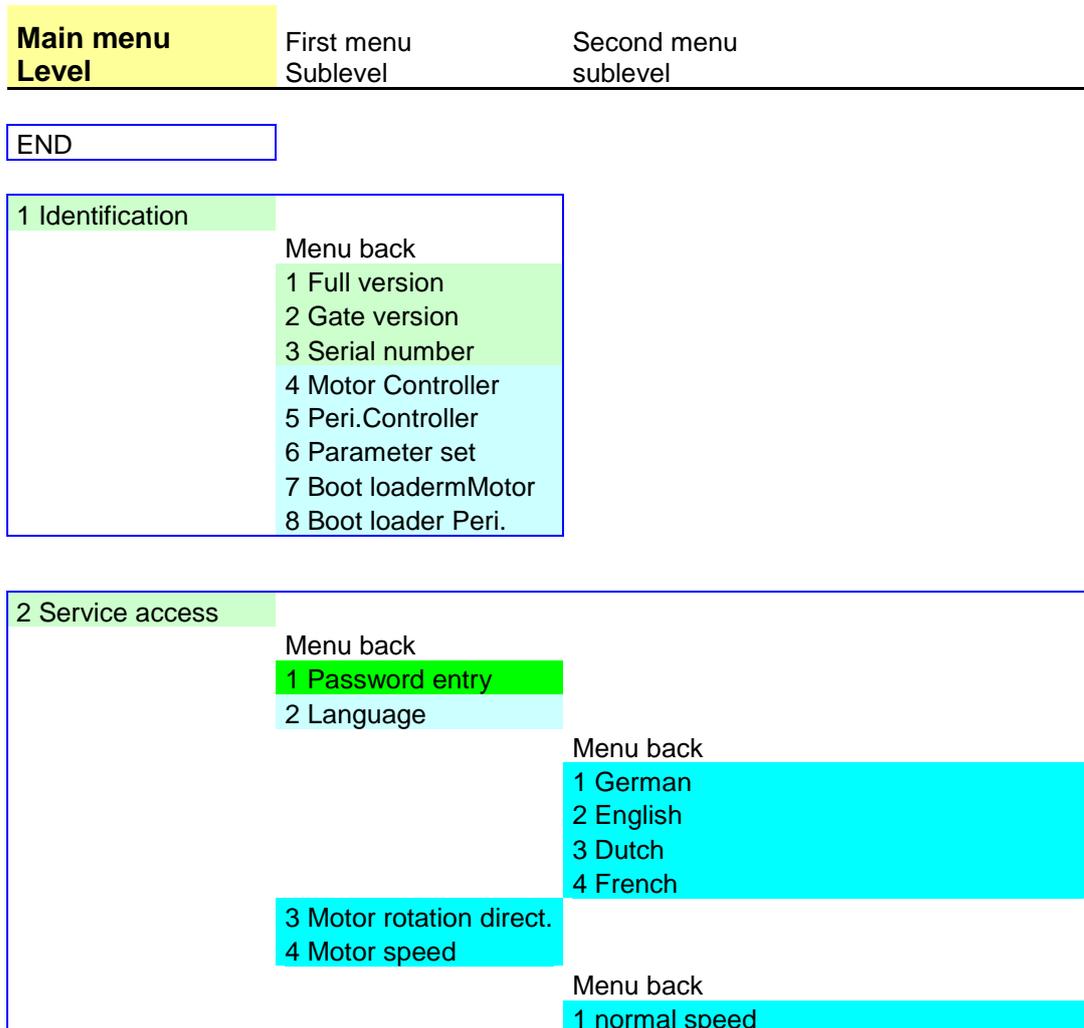
The individual menu points can be selected by rotating the selection switch and by pressing it. The first menu item on each menu level leads back one level.

The menu item closes the menu display and executes a restart of the control system software.



### 5.5 Menu structure and displayed texts

One finds oneself on the main menu level after selecting the menu. This offers the ability to select from multiple submenus. The menu system can be quit with the first menu item „END“. With a reset one comes back to the control system's active operating mode. The depth of the menu depends on the entry of the correct password. There are branches to submenus on the second level from the submenus on the first level.



	2 average speed
	3 high speed
5 PWM Boost	
6 recopy PAR	

3 Diagnostics	
	Menu back
1 Gate status	
	Menu back
	1 Gate status
	2 Input: 87654321
	3 Output: 54321
	4 Run cycles
	5 Last maintenance
	6 BACK maintenance
2 Sensor status	
3 System log book	
4 Event Logbuch	
5 Temperatures	
	Menu back
	1 FU temperature
	2 BACK min/max

4 Settings	
	Menu back
1 Konfigure timer	
	Menu back
	1 Lighting (s)
	2 TMR Keep open
	3 TMR partialOPEN Stop
	4 TMR automatic close
	5 Secondary time (s)
	6 Light output
	7 Blinking light pre-warning
	8 Run till part.Open
2 Input: In3/4	
	Menu back
	1 Variant 1
	2 Variant 2
	3 Variant 3
3 Sicherheiten	
	Menu back
	1 Light barrier
	2 Stat.Edge OPEN
	3 Stat.Edge CLOSE
	4 Trav.Edge OPEN
	5 Trav.Edge CLOSE
	6 Reference run
4 Special parameters	
	Menu back
	1 Mainten.after cycles
	2 Maintenance interval
	3 Maintenance output
	4 Maintenance action

	5 break output
5 Operation mode	Menu back
	1 Deadman operation
	2 Automatic operation
6 Status report	Menu back
	1 Status gate 1
	2 Status gate 1 output
	3 Status gate 2
	4 Status gate 2 output
	5 error message output
5 Radio remote control	Menu back
	1 Active transmitters
	2 Learn transm.switch
	3 Learn transm.open
	4 Learn transm.close
	5 Learn partialOPEN
	6 Delete transmitter
	7 Delete transm.pos.
	8 Delete all

Legend:

Light green:	visible for customer and technician
Dark green:	visible and adjustable for customer and technician
Light blue:	visible for technician (with password)
Dark blue:	changeable for technician (with password)

## 6. Parameter settings

### 6.1 General instructions on parameterization

Large parts of the 6040-FR's control functions are realized via changeable parameters that are saved in the device. Said parameters are loaded in the control system during the manufacturing process and ensure a specific behavior for a defined gate. Many of these parameters can be accessed by the gate user or setter via the menu system.

#### 6.1.1 Navigating in menu

The menu selection and navigation for password entry should be demonstrated here via the depiction of the operating modes. The display shows „automatic operation“ (Automatikbetrieb) and the rotary and selection switch is pressed for two seconds and released once the menu display changes. This results in the following display:

Main menu  
1 Identification

The following display appears by rotating the selection switch clockwise to the right to a guide groove:

Main menu  
2 Service access

This menu item can be activated by briefly pressing the selection switch; one goes a menu level deeper in the service menu:

Service access  
1 Password entry

This menu item is also activated by pressing the selection switch and you are able to enter the password:

Password entry Value: 33333
--------------------------------

One can change the preset, displayed value by rotating. In the process, quicker rotation movements result in a faster change in of the values.

The configured value is saved by pressing, and the previous menu item is shown again:

Service acces Password entry
---------------------------------

If the password was entered correctly, the menu items and entries covered by the password can be selected immediately. The password remains valid for 10 minutes. It automatically resets itself to the value 33333 if not additional entries are made. If one enters a number other than the correct password, the number remains saved and is not reset to the value 33333.

By pressing the selection switch for two seconds, the main menu item

Main menue End
-------------------

can be selected at any time. The control system executes a restart of the program once this menu item is confirmed (reset) and returns to the active operating mode (here: „automatic operation“).

## **6.2 Setting up the gate**

The following installations and parameterizations make sense and are necessary for the start-up of the 6040-FR. All configurations and displays that can only be accessed by a trained technician are protected with a password.

### **6.2.1 Installation of the command keys for deadman operation**

At least one OPEN and one CLOSE button must be connected for deadman operation before a gate can be put into operation. These buttons are necessary for setting up the end positions. The following items must be completed in sequence.

- Switch control system to a zero-potential state
- Reconnect the voltage supply for the buttons to 24 V
- Connect buttons for OPEN (deadman button) to the input terminal In8 (make contact)
- Connect buttons for CLOSE (deadman button) to the input terminal In7 (make contact)
- Switch on power supply for control system
- Check buttons' function

### **6.2.2 Change drive's direction of rotation**

If it is determined during the very first start-up of the motor on the gate that the gate moves in the wrong direction, the motor's direction of rotation can be established by exchanging two phases of the motor line. On the other hand, it is also possible to change the direction of rotation via a software setting. This change is done as follows:

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Service access“, „motor direction of rotation“: Change value to „1“
- Correct gate movement must be checked again!

### **6.2.3 Parameterize immobile safety contact edges**

The immobile safety contact edges are always activated at the factory.

- Switch control system to a zero-potential state
- Connect contact edge(s) for the OPEN direction to the edge connection
- Connect contact edge(s) for the CLOSE direction to the edge connection
- Switch on power supply for control system
- Check for correct connection of the edges with the „sensor depiction“ display and the gate's reaction in the corresponding movement direction in „automatic operation“!

If the immobile safety contact edge is not necessary in the CLOSE direction, for example, it can be deactivated as follows:

- Menu: „Service access“, „Password entry“: Enter password

- Menu: „Settings“, „Safeties“ „Stat.edgeCLOSE“: Set value to „0“
- Check for correct gate movement in the corresponding movement direction in „automatic operation“!

### **Inward transfer of different sensors into the safety circuit for the immobile contact strips**

Further contact strips (e.g. the gate accompanying edges) whose status is transmitted via radio, can be connected in series with the corresponding immobile safety edge for that running direction or with a 8,2 kOhm resistance. In that case the receiver's relay which signalises the status of the edge(s) is connected in series with the 8,2kOhm of the SKL (open or close) input as a break contact.

Activation of the safety edge on the radio system opens the safety circuit with the 8,2kOhm resistance of the control system then and provokes the according safety function in the control unit.

The connection of a radio transmission system for safety contact edges from JCM is pictured in the following table. As an example an accompanying safety contact edge in running direction CLOSE was connected. As opener in the circuit of the 8,2 kOhm safety contact edge of the control unit the relay R1 is integrated.

At this connection version the radio system isn't tested for proper function by the control unit.

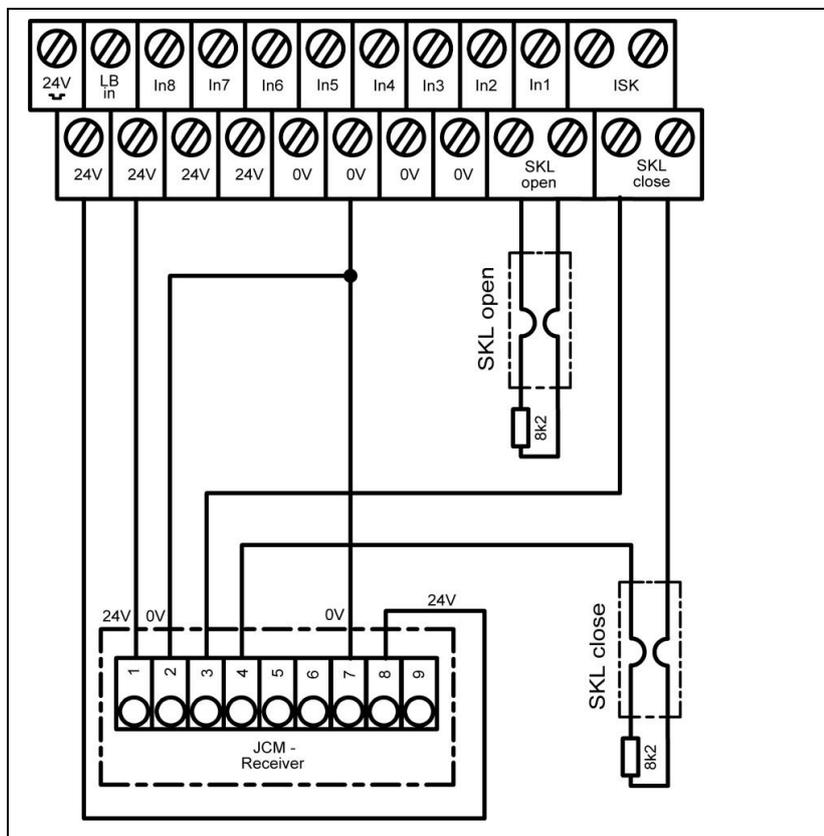


Figure 11: connection of a JCM radio transmission system for contact strips (untested)

If the valid standards for power operated gates shall be met the radio transmission unit has to be transferred by a test signal into a mode which makes verifiable the proper function of the shut-off path. The connection of that system to the control unit with a test signal is pictured in the following drawing. Additionally the test signal of the control system with negative pulse was connected to the input 'ATEST1' of the JCM system. This test signal provokes a testing of the radio system every five minutes (and after each run).

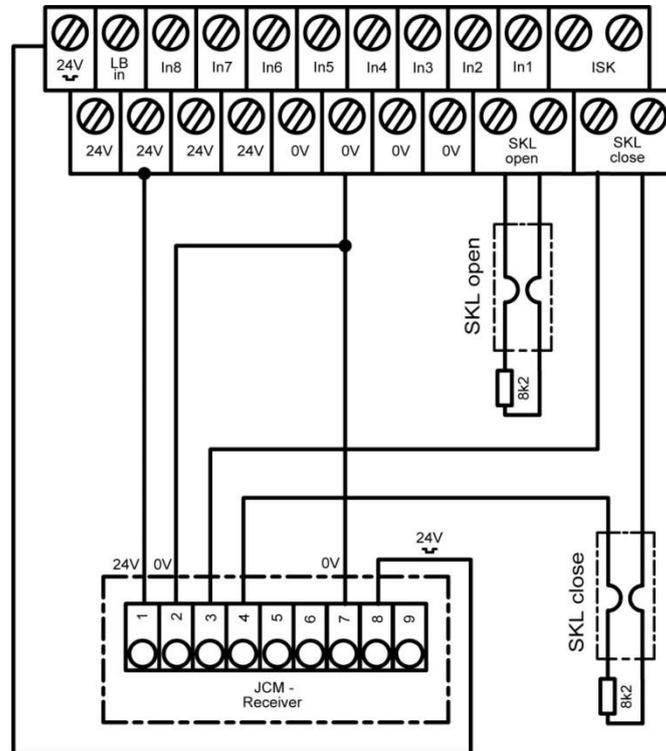


Figure 12: Connection of a JCM radio transmission system for contact strips (tested)

In order to analyse and interpret the output signal R1 of the radio receiver properly during the test the control system has to be instructed by a parameter of the connection of the tested input. In said case it is the input of the immobile safety contact edge in CLOSE direction

- Menu: 'Servie access', 'password entry': enter password.
- Menu: 'Settings', 'safeties', immobile edge CLOSE': set the value to '2'
- Check for the correct gate run in the corresponding running direction in 'automatic operation'

The wiring of the jumpers of the radio transmission system of JCM (transmitter and receiver) is shown in the following drawings:

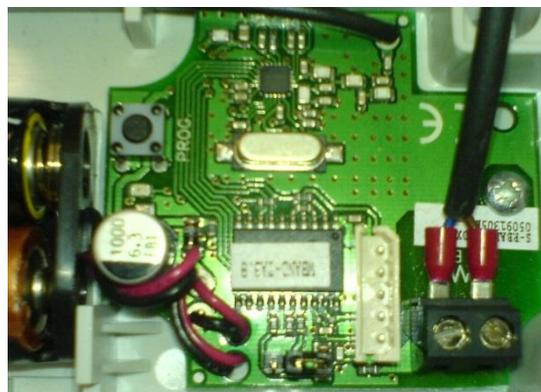


Figure 13: wiring and jumper: JCM radio transmitter

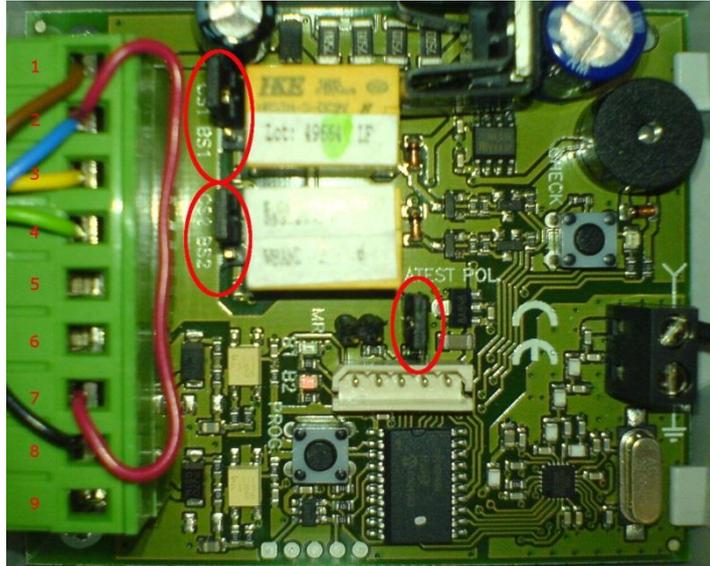


Figure 14: wiring and jumper: JCM radio receiver

#### **6.2.4 Parameterize accompanying safety contact edges (INDUS)**

The accompanying safety contact edges are NOT activated at the factory.

- Switch control system to a zero-potential state
- Connect 620-3 to the SKL connection
- Switch on power supply for control system
- Menu: 'Service access', 'Password entry': enter password
- Menu: 'Settings', 'Safeties', 'accomp. edgeCLOSE': set value to '1'.
- Check for correct gate run at the corresponding direction in 'automatic operation'!
- Check for correct connection with the display 'sensor depiction' and the gate's reaction in the corresponding movement in 'automatic operation'

If the accompanying safety contact edge for the OPEN direction is needed, it can be activated as follows:

- Menu: „Service access“, „Password entry“: Enter password.
- Menu: 'Settings', 'Safeties', „Accom.EdgeOPEN“: Set value to „1“
- Check for correct gate movement in the corresponding movement direction in „automatic operation“!

#### **6.2.5 Installation of the gate's end switches**

The 6040-FR control system is preconfigured for the operation of doors and gates with end switches. Various designs for end switches (proximity switches, mechanical switches, etc.) can be used, but all must be designed as break contacts. The electrical connection of both end switches for the positions „gate open“ and „gate closed“ are shown in Section „4.3.6“ of this document. The gate's end switches are connected and checked as follows during setup:

- Switch control system to a zero-potential state
- Mechanically mount both end switches in the gate's respective end positions
- Connection signal line from the CLOSE end switch to terminal IN1
- Connection signal line from the OPEN end switch to terminal IN2
- Switch on the control system's power supply and check the correct connection of the end switches with the „sensor depiction“ display and the gate's reactions in „deadman operation“!

The control system is now also able to function with end switches.

## **6.2.6 Programming the gate's runtime between the end positions**

The control system must measure the motor runtime between the gate's end positions with a reference run so that the drive motor can reduce its maximum speed shortly before reaching the end switches. It can then estimate the gate's pathway using the runtime with the respective end switch as reference point and can move more slowly into the gate's end positions. This reference run can be initiated in the following ways:

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Safeties“, „Reference run“: Set value to „2“
- Menu: Press „Settings“, „Operating mode“, „Automatic operation“
- Quit menu. The control system executes a reset and is in automatic operation
- Press CLOSE button. Gate moves in the direction of the CLOSE position
- The gate stops when the CLOSE end switch is reached and automatically moves in the OPEN direction. The gate stops again upon reaching the OPEN end switch and saves the measured motor runtime. The control system then executes a reset.
- Check the slower approach of both end positions and the motor stop once the end positions are reached!



**Attention:** The programming of the motor runtime must always start first with the approach of the CLOSE position. The runtime is measured from the CLOSE position to the OPEN position.

The control system is then functionable in automatic operation.

## **6.3 Additional function parameters**

With the settings from Chap. 6.2 everything has been done to safely operate the gate. Furthermore, numerous other installations and configurations of the control system are possible. All configurations and displays that can only be accessed by a trained technician are protected with a password.

### **6.3.1 Setting the language**

The technician can change the language of the menu interface after entering the password. Various languages can be selected.

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Service access“, „Language“: Select language
- The display is immediately shown in the new language once the language has been selected

### **6.3.2 Changing the operating mode: Deadman operation / automatic operation**

The technician can specifically switch the control system - which normally runs in automatic operation - to deadman operation. The gate can then only be activated with the connected deadman buttons for the OPEN and CLOSE directions (IN8 and IN7). The external safety devices (safety contact edges and light barrier) are deactivated in the process.

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Operating mode“: Select operating mode
- Check function!

### **6.3.3 STOP operating element**

A STOP button or switch can be connected to input „In6“ to stop a running motor or to prevent a motor from starting. This element must be designed as a break contact. Multiple break contact circuits can also be switched sequentially one after the other in the form of a STOP chain (e.g. motor temperature switch, access switch, STOP button).

- Switch control system to a zero-potential state

- Connect STOP button to input terminal In6 and to +24V (break contact)
- Switch on power supply for control system
- Check function!

#### **6.3.4 OPEN operating element**

In addition to the deadman OPEN, an additional OPEN button can be connected to IN5 to trigger the opening of the gate. The function on this input is only supported in automatic operation. The input can thus also be used by loop detectors, radio receivers, timers or static switches for opening the gate and keeping it open.

- Switch control system to a zero-potential state
- Connect OPEN button to In5 and +24V input terminal (make contact)
- Switch on power supply for control system
- Check function!

#### **6.3.5 Selecting the operating functions on inputs In3 and In4**

Three various combinations can be selected for both command inputs In3 and In4 by selecting the submenu „Input: In3/4“ in the „Settings“ menu. Variants 1 to 3, which are listed in the following three tables, are available.

##### **Variant 1**

Terminal No.	Designation	Input function
3	In8	Deadman button OPEN (e.g. key switch button on gate)
4	In7	Deadman button CLOSE (e.g. key switch button on gate)
5	In6	STOP button (break contact)
6	In5	OPEN impulse
7	In4	PartialOPEN impulse (pedestrian passage)
8	In3	TOGGLE switching impulse (OPEN /STOP/CLOSE /STOP / ...)
9	In2	End switch for OPEN position (break contact)
10	In1	End switch for CLOSE position (break contact)

In the default setting for variant 1, the PartialOPEN command function is on the input terminal In4. Input In3 is assigned the function toggle switching impulse.

The following alternative input functions can be selected for both of the yellow marked inputs „In4“ and „In3“ under the submenu „Settings“:

##### **Variant 2**

Terminal No.	Designation	Input function
7	In4	PartialOPEN impulse (pedestrian passage)
8	In3	CLOSE impulse

##### **Variant 3**

Terminal No.	Designation	Input function
7	In4	ZU Impuls
8	In3	TOGGLE Umschaltimpuls (AUF / STOPP / ZU / STOPP / ...)

### **6.3.6 CLOSE operating element**

A button that generates a movement command in the gate CLOSE direction can be connected to input „In3“ (variant 2) or „In4“ (Variant 3). The function is only supported in automatic operation.

- Switch control system to a zero-potential state
- Connect CLOSE button to input terminal In3 or In4 and +24V (make contact)
- Switch on power supply for control system
- Check button's function

### **6.3.7 Set up partial OPEN function (pedestrian passage)**

A button or switch contact (closer) is connected to input In4 (variants 1 and 2) to set up a Partial OPEN function (pedestrian passage). The function is only supported in automatic operation.

- Switch control system to a zero-potential state
- Connected button/switch for Partial OPEN to input In4 and +24 V
- Switch on power supply for control system
- Check the gate's partial open function

The gate's opening width from the CLOSE position to the PartialOPEN position depends on the configured motor runtime for the movement. Said preconfigured runtime can be changed in the menu as follows:

- Menu: „Settings“, „Set timer“, „Runtime to PartialOPEN“: Select greater or smaller value (increase or reduce opening width)
- Quit menu
- Move the gate from the CLOSE position to the PartialOPEN position and check opening size

### **6.3.8 Operating element switch impulse button (toggle)**

A button that generates OPEN, STOP, CLOSE, STOP movement commands via a switching impulse can be connected to input „In3“ (variants 1 and 3). Each time the button is pressed, either a motor operation is started or a running operation is interrupted with the stop command. The new direction of movement is always in the opposite direction of the last movement. The function is only supported in automatic operation.

- Switch control system to a zero-potential state
- Connect toggle impulse button to input terminal In3 and +24 V (make contact)
- Switch on power supply for control system
- Check button's function

### **6.3.9 Setting up light barrier**

The light barrier input only works during the gate movement in the CLOSE movement direction. The gate move into the OPEN end position if the light barrier is interrupted.

#### **• Deactivate light barrier**

The light barrier can be deactivated if no light barrier shall be installed.

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Safety“, „Light barrier“: Set value to „0“

#### **• Light barrier with break contact**

The light barrier is always preconfigured with break contact in the delivery state. It is connected as follows:

- Switch control system to a zero-potential state
- Connected light barrier power supply with +24V and 0 V

- Connect light barrier signal to input terminal LBin (break contact)
- Switch on power supply for control system
- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Safeties“, „Light barrier“: Set value to „1“
- Quit menu
- Check for correct connection of the light barrier function with the „Sensor depiction“ display and the reaction for gate movement in the CLOSE direction in „automatic operation“!

If one wants to connect a tested light barrier as shown in figure 5, the parameter value for the „light barrier“ must be set to „2“.

- **Light barrier with make contact**

If there is a light barrier with make contact, it can also be used with the help of the following parameterization:

- Switch control system to a zero-potential state
- Connected light barrier power supply with +24 V and 0 V
- Connect light barrier signal to input terminal LBin (make contact)
- Switch on power supply for control system
- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Safeties“, „Light barrier“: Set value to „3“
- Quit menu
- Check for correct connection of the light barrier function with the „Sensor depiction“ display and the reaction for gate movement in the CLOSE direction in „automatic operation“!

### **6.3.10 Connecting a blinking light**

The output for relay „Rel1“ is configured for the blinking function at the factory.

An automatic blinking light for +24V is connected to relay „Rel1“ as follows:

- Switch control system to a zero-potential state
- Connect +24 V power supply to output relay „Rel1“
- Connect blinking light to output relay „Rel1“ and to GND (0 volt)
- Switch on power supply for control system

The control system turns on the blinking light as soon as a movement command is detected and can be executed by the control system. It remains active until the motor is activated.

The relay for the blinking light is also turned on three seconds before an automatic gate supply and remains active during the gate supply.

In some countries regulations specify that the advance warning must be active for three seconds prior to gate movement (also before opening). Only then is the motor activated and the gate moved. This general advance warning can be switched on or off as follows:

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Set timer“, „Blinking light advance warning“:
  - o Value 0: general advance warning time switched off
  - o Value 1: general advance warning time switched on
  - o

### **6.3.11 Setting up lighting (courtyard light)**

The 6040-FR can activate lighting that automatically illuminates the gate area in the event of movement, for example. The function can be configured on Rel2 or Rel3 if the assignment of these relays was first released via the gate status display. The configuration for Rel3 is described here as an example.

- Switch control system to a zero-potential state
- Connect lamp to output relay Rel3
- Switch on power supply for control system
- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Set timer“, „light output“: set to „Rel3“
- Menu: „Settings“, „Set timer“, „Lighting (s)“: Set the desired time (in seconds). The value must be greater than 0, otherwise the relay is not activated

The lamp connected to „Rel3“ will now be turned on by the control system as soon as a movement command is detected. The lamp continues to be illuminated for the corresponding time (1 to 1800 seconds) after the motor is shutdown. This parameter „Lighting (s)“ can also be changed by the customer without entering the password.

### **6.3.12 Connecting a gate status display**

The 6040-FR can signal two different gate statuses and a command status via relays.

The output relay „Rel2“ is configured in such a way at the factory that it is closed when the gate’s OPEN position is reached. The output relay „Rel3“ is configured in such a way that it is closed at „Gate CLOSED“.

If one of these two relays is used for another function (e.g. „courtyard light“), the status display function must first be taken out of the configuration for the relays. Only then can the corresponding relay be parameterized with the new function. The „Gate CLOSED“ status display on relay 3 is deactivated as follows:

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Status report“, „Gatestat.2 output“: set to „---“

In this way the gate status 2 (Gate CLOSED) function is no longer signalled with relay 3. This relay can now be parameterized with a new function (e.g. „courtyard light“ as described in section: 6.3.11)

### **6.3.13 Additional electrical brake**

An additional electrical brake can be parametrized instead of a gate status display to an output relay ‘Rel2’ or ‘Rel3’. The relay switches as soon as the motor is supplied by the control unit (brake is released). With the shut-down of the motor the relay drops out (brake fix).

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Special parameters“, „Brake output“: set to „Relx“

The selected relay (break contact) switches as soon as the control system supplies the motor (brake released). The relay also switches off when the motor shuts down (brake applied).

### **6.3.14 Parameterizing a maintenance cycle counter**

In order to guarantee regular gate maintenance, it is possible to define a maintenance requirement after a specific number of gate movements. If the defined number of gate movements is reached or exceeded, the event „Maintenance requirement“ is triggered in the control system. In the event of an active maintenance requirement, the message

<p>Wartung erforderlich Maintenance necessary</p>
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is shown on the display. In the delivery state, the value for the number of gate movements is preconfigured with 5.000 movements.

Maintenance can be parameterized as follows:

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Special parameters“, „Maintenance after cycles“: Set to „zz“

The entry „zz“ defines a number of cycles (in 1000 cycles) that the gate goes through to „open“ and „close“. The counter is increased each time the „CLOSE“ end position is reached. The control system activates the maintenance requirement once the counter reaches the preconfigured value of „zz“.

The value “zz” is the maximum number of gate cycles (in 1000 cycles) (CLOSE, OPEN, CLOSE) until the service requirement. The settable values signify the following:

- 0 = no maintenance requirement according to number of movement cycles
- 25 = 25000 complete OPEN and CLOSE movements

### **6.3.15 Parameterizing a maintenance interval**

In order to guarantee regular gate maintenance, it is possible to define a maintenance requirement after a specific time (number of months). The event „Maintenance requirement“ is triggered in the control system once the defined time is reached or exceeded. In the event of an active maintenance requirement, the message is shown on the display.

Wartung erforderlich  
Maintenance necessary

In the deliver state, the value for the time is preconfigured with 12 months. Maintenance can be parameterized as follows:

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Special parameters“, „Maintenance interval“: Set to „mm“

The entry „mm“ defines the number of months until the maintenance requirement. The value 0 means: no time-based maintenance requirement. The maximum configurable value is 60, which corresponds to 5 years. Since there is no integrated real-time clock module, the time is only counted when the control system is turned on.

### **6.3.16 Parameterize maintenance requirement for relay output**

A maintenance requirement for the control system can also be parameterized for a relay output via a menu entry. The corresponding relay is switched to active as soon as a condition for the maintenance requirement is fulfilled in the control system and can be used for signalling purposes.

### **6.3.17 Parameterize maintenance requirement for blinking light**

A maintenance requirement for the control system can also be triggered for an additional blinking light action via a menu entry. As soon as a condition for the maintenance requirement is fulfilled in the control system, the blinking light is kept active for a few seconds longer after each run to the gate’s end position (blinking light only goes out 4, 8 or 12 seconds after motor shutdown).

The blinking lights are additionally activated for the maintenance requirement as follows:

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Special parameters“, „Maintenance action“: Set 0 to 3

The following actions are linked to the configured parameter value:

Parameter value	Blinking light function in terms of maintenance requirement
0	No additional blinking light function
1	The blinking light remains switched on for four seconds longer after the OPEN or CLOSE gate position is reached
2	Blinking light remains switched on for 8 seconds longer
3	Blinking light remains switched on for 12 seconds longer
4	Slow motor speed
5	Slow motor speed and the blinking light remains switched on for 4 sec. longer after the gate position OPEN ore CLOSED is reached
6	Slow motor speed and the blinking lights remains switched on for 8 sec. longer
7	Slow motor speed and the blinking light remains switched on for further 12 sec.

### **6.3.18 Resetting the maintenance requirement**

The text „< MAINTENANCE > required“ will always periodically appear on the LC display as long as the maintenance requirement has not been dealt with or confirmed by the service technician in the control system's menu. In addition, the blinking light is kept active for a few seconds longer after every movement to the gate's final position (when this has been parameterized). Furthermore, a relay output can be parameterized and then switched to active.

After successful maintenance of the gate and testing of the safety functions by qualified personnel, this can be confirmed in the control system in the following manner and thus the maintenance requirement can be reset:

- Menu: „Service access“, „Password entry“: Enter password
- Menu: Activate „Diagnostics“, „Gate status“, „RESET maintenance“

The time counter for the number of months that have gone by and the cycle counter for the number of gate movements are reset to 0.

### **6.3.19 Resetting all parameter settings**

In the „Service access“ menu there is a menu item which one can reset all parameters to the preconfigured values (factory settings).

- Menu: „Service access“, „Password entry“: Enter password
- Menu: Activate „Service access“, „Par. reset“

The configurable values (timer, sensors, inputs/outputs, motor values and operating mode) are thus reset to the pre-configuration.

### **6.3.20 Setting the boost value**

Frequency converters supply the connected electric motor at lower frequencies than 50 Hertz with less than 230 AC voltage. With increasing frequency the voltage is increased, too, until 230 AC is reached at 50 Hz. This makes possible to limit the maximum current and to not stress the whole system excessively. If the motor doesn't create enough torque at low revolutions the tension and with it the current supply can be increased at low frequency by increasing the boost value.

### **6.3.21 Setting the motor speed**

In automatic operation it is possible to pre-set different motor speeds for different big and heavy gates. You can select the 'normal' (50 Hz) speed, the middle (62 Hz) and the 'fast' (75 Hz).

For safety reasons the measured forces on the main and secondary closing edges have to be considered.

- Menu: 'Service access', 'Password entry': Enter password
- Menu: 'Service access', 'Motor speed' select
- Select one of the offered speeds 'normal speed', 'average speed' or 'high speed'.

## **6.4 Automatic gate movement timing**

Some gate movements can be automatically triggered by predefined time settings. The parameterization of these times per menu should be shown here.

### **6.4.1 Configure automatic closing (hold-open time)**

The control system can automatically close the gate again upon reaching the OPEN end position after a configurable time (1 to 999 seconds). This function is only active in automatic operation and after reaching the OPEN end position.

- Menu: „Settings“, „Set timer“, „TMR hold open“: set to „xxx“

#### **Example:**

A preconfigured parameter „TMR hold open“ with the value 5 causes a time counter that automatically closes the gate after five seconds to be started in automatic operation once the OPEN end position is reached. The time counter restarts, if an additional OPEN command is given or an installed light barrier is activated during this period.

This value can also be entered by the customer without entering the password.

#### **6.4.2 Time for closing from the PartialOPEN position**

The control system can automatically close the gate again upon reaching the PartialOPEN position after a configurable time (1 to 255 seconds). This function is only active in automatic operation and after reaching the PartialOPEN position.

- Menu: „Settings“, „Set timer“, „TMR hold PartialOPEN“: set to „xxx“

#### **Example:**

A preconfigured parameter „TMR hold PartialOPEN“ with the value 5 causes a time counter that automatically closes the gate after five seconds to be started in automatic operation once the PartialOPEN position is reached. The time counter restarts if during this time an additional PartialOPEN command is given or if a static PartialOPEN permanent command applies.

This value can also be entered by the customer without entering the password.

#### **6.4.3 Time for closing the gate from intermediary positions**

If the gate should always automatically close after a configurable time (1 to 255 seconds) regardless of the gate's position (automatic closure), this function can be configured via the parameter „TMR autom. close“. This function is only active in automatic operation and affects all of the gate's positions except for the OPEN end position and the PartialOPEN position.

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Settings“, „Set timer“, „TMR autom. close“: set to „xxx“

#### **Example:**

A preconfigured time 20 causes a time counter that automatically closes the gate after 20 seconds to be started in automatic operation when the motor stops outside of the CLOSE end position (not with STOP button).

This value can also be entered by the customer without entering the password.

#### **6.4.4 Setting the time for closing reduction**

When using a light barrier the control system can register a shorter hold open time after having passed that light barrier.

- menu: 'Service access', 'Password entry': Enter password
- menu 'Settings', 'set timer', 'secondary time (s)': set to 'xxx'

Example: A set figure '5' causes in automatic operation the start of a time counter when passing the light barrier, which makes the gate close again automatically after five seconds.

### **6.5 Integrated radio remote control (FU21.2)**

Software has been integrated into the control system variant with integrated radio receiver which allows for the signals to be received by the radio hand-held transmitter and thus for the gate to be operated in automatic operation.

#### **6.5.1 Number of programmed transmitters (button functions)**

The receiver must first be reported (programmed into) the control system before a gate action can be executed with a radio hand-held transmitter. The number of programmed transmitters can be displayed with this menu item.

- Menu: Activate „Radio remote control“, „Active transmitters“

The number of programmed transmitters (button function) is shown on the display.

#### **6.5.2 Program new transmitters (button functions) into the control system**

The receiver must first be reported (programmed into) the control system before a gate action can be executed with a radio hand-held transmitter. The hand-held transmitter must be suitable for the radio receiver and the installed decryption software (for example: 433 MHz AM; 12 bit coding). The programming of the transmitter / a button can be completed with the following menu items.

2 Learn transmitter SWITCH	Programming of a „toggle“ function OPEN - STOP - CLOSE - STOP
3 Learn transmitter OPEN	Programming an OPEN function
4 Learn transmitter CLOSE	Programming a CLOSE function
5 Learn PartialOPEN	Programming a partial opening of the gate (pedestrian passage)

The function to be programmed is shown on the display after selecting the upper row. Now the operator has 20 seconds to press the desired button on the hand-held transmitter. A memory location is thus assigned for each individual button function.

The transmitter's received coding with the special, pressed button is stored as a reference value in the control system's memory. The number value of the received radio signal and the memory location at which this transmitter was stored appears on the display for two seconds.

„RF# xxxx “

„Pos.: p “

The display then returns to the menu. Additional transmitters can now be programmed one after the other by activating this menu item multiple times.

The display returns to the menu if the program does not detect a valid code 20 seconds after the programming process was activated.

### **6.5.3 Delete a transmitter from the control system**

If a specific hand-held radio transmitter or a special button on the transmitter needs to be deleted from the control system, this can be done via the „Delete transmitter“ menu item.

- Menu: Activate „Radio remote control“, „Delete transmitter“
- 

„Delete transmitter“ is shown in the upper row on the display. The operator now has two seconds to press the desired button the hand-held transmitter to delete the transmitter from the control system's memory. The display returns to the menu after the deletion is executed.

The display returns to the menu if the program does not detect a valid, saved code 20 seconds after the deletion process was activated.

### **6.5.4 Delete a channel from the control system**

If a specific hand-held radio transmitter or a special button on the transmitter needs to be deleted from the control system without the corresponding hand-held transmitter being available, this can be done via the „Delete transmitter“ menu item.

- Menu: Activate „Radio remote control“, „Delete channel“

A list of all programmed hand-held transmitters and functions is shown. The memory location to be deleted is selected by rotating the selection switch. The question „Delete entry?“ appears on the display after the rotary switch is pressed. The entry is deleted once the rotary switch is pressed again; the deletion is confirmed with the display „Complete“.

Pressing the switch again causes the menu to return to the selection „Delete channel“.

### **6.5.5 Delete all transmitters from the control system**

All hand-held radio transmitters are removed from the control system's memory with the menu function „Delete all“. Here one needs neither the corresponding transmitters nor a radio receiver. Remote control of the gate with hand-held radio transmitter is no longer possible until the next programming process once this menu item has been called up. The deletion of all transmitters can be executed with the following menu item.

- Menu: Activate „Radio remote control“, „Delete all“

## **6.6 Support for diagnose**

The 6040-FR has got a diagnose menu which facilitates the start-up of the control system and the repair of arisen mistakes

### 6.6.1 Version display

The control system version can be displayed as follows:

- Menu: „Identification“, „Full version“: The displayed letters and number combination uniquely identifies the software used
- Menu: „Identification“, „Gate version“: The displayed text shows the gate designation for which the control system, software and saved parameters are defined
- Menu: „Identification“, „Serial number“: The control system serial number is displayed

The following version parameters can also be seen after the correct password is entered:

- Version of the motor controller program
- Version of the peripheral controller program
- Version of the loaded parameter table
- Version of the motor controller's boot loader
- Version of the peripheral controller's boot loader

### 6.6.2 Active movement commands in switch on process

During start up the DRICO slife 150 FU 21.2 executes a test of the configured inputs after a program reset or current switch-on. Active movement commands (break contacts that are statically pulled to GND, make contacts that are statically pulled to +24 V) result in the control system not yet starting. The recognized sample for the inputs is shown on the display:

OPEN/CLOSE-startActive  
Value: 01101010

For example, the input „In7“ (deadman button CLOSE) was active during start-up with regard to the display shown. The control system's program once again executes a restart after a change to the relevant input signals.



**Information:** This function is suppressed for inputs with the function „PartialOpen“ and „OPEN“, as there may also be static signals (e.g. external clock timers) on this inputs at start-up. However, the static signals still do not result in uncontrolled gate movement during start-up.

### 6.6.3 Gate status

All information that represents the current status of the control system in connection with the gate is summarized in the menu Gate status.

The menu is reached via „Diagnostics“ and has the following subitems:

Menu	Display	Meaning
Gate status	OPEN / CLOSE / PARTIALOPEN / STOP	The current gate status recognized by the software is shown.
Input: 87654321	Value: 00000010	The logical values on the control system's input terminals are shown. The series corresponds to inputs In8 to In1. An active input is shown with „1“. In the example, input In2 is on +24 V potential.
Output: 54321	Value: 00010	The status of the output relays is shown with its logical values. An activated relay is marked with „1“. The sequence corresponds to outputs Rel5 to Rel1. Relay Rel2 is activated in the example.
Run cycles	5217 / 19	The total number of runs and the number of runs since the last maintenance are shown. Here, a run is an OPEN-CLOSE cycle.
Last maintenance	7 months	The number of months that have passed since the last maintenance are shown here.

A maintenance interval based on the number of gate movements can be defined to ensure regular gate maintenance.

In the event of an active maintenance requirement (number of run cycles and/or number of operating months reached), the message „< MAINTENANCE > required“ is shown in the display.

< Maintenance > required
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The maintenance requirement can be reset after the correct password has been entered via the menu item „Diagnostics“, „Gate status“, „RESET maintenance“. The number of run cycles since the last maintenance is thus reset to 0. The time counter for the number of months that have gone by is also reset.

**6.6.4 Sensor status**

The sensors' status can be seen via „Diagnostics“, „Sensor status“. The design of the menu is identical to the display in the operating state as shown in Section „5.2.2 LCD sensor depiction“.

**6.6.5 Temperature of power electronics**

The current temperature, the maximum observed temperature and the minimum observed temperature of the power electronics can be displayed. The display for this is reached as follows:

- Menu: „Service access“, „Password entry“: Enter password
- Menu: „Diagnostics“, „Temperatures“, „FU temperature“ shows the observed temperatures in the frequency converter's power component. The current as well as the minimum and maximum temperature since the last reset are shown
- Menu: Activate „Diagnostics“, „Temperatures“, „RESET min./max.“, set the minimum and maximum value for the respective displays to the current temperature

**6.6.6 Integrated logging systems**

Two different log book memories are integrated into the control system.

- **Event log book:**

The event log book is a ring memory with up to 30 entries. Here, relevant events from the control system software are filed in volatile memory (RAM) with a reference number and a time stamp. The entered time is based on the elapsed number of hours since the control system was put into operation the first time. Using this log, the gate's last actions and any possible errors that have occurred can be traced.

The event log book is displayed as follows:

- Menu: „Service access“, „Password entry“: Enter password
- Menu: Activate „Diagnostics“, „Event log book“

The time of the entry is shown in the first row. At the beginning of the second row there is a one-to-three-digit number that corresponds to a reference number from the parameter table. This is followed by a corresponding text that is also stored in the parameter table. By rotating the selection switch it is possible to flip through the entries--sorted by time-- in the event log memory. The very first entry in this log is always the instruction for program initialization as a result of a software restart.

Display	Meaning
Event log book Start	First memory entry made
HHH 250 program init	Log entry due to control system restart
Event log book End	Last memory entry made

By quitting the menu (restart) the RAM is re-initiated and the data that was available is lost.

- **System log book:**

The system log book is also a ring memory, but with up to 254 entries. However, in contrast to the event log book these data are permanently stored in the memory and are also available after a restart or a power failure. The content of the system log book is similar to that of the event log book. Navigation within the system log book is similar to the event log book. Targeted deletion of these data is not intended. Only the initialization of the entire parameter memory resets the system log book.

The system log book is displayed as follows:

- Menu: „Service access“, „Password entry“: Enter password
- Menu: Activate „Diagnostics“, „System log book“

## **6.7 Parameters for reference and error numbers**

The entries possible in the abovementioned log systems for events or errors that have occurred are briefly listed below:

<b>Reference-/ error no.</b>	<b>Text</b>	<b>Meaning</b>
25	Stat.EdgeOPEN	Stationary safety contact edge OPEN was activated
26	Stat.EdgeCLOSE	Stationary safety contact edge CLOSE was activated
27	Accom.EdgeOPEN	Accompanying safety contact edge OPEN was activated
28	Accom.EdgeCLOSE	Accompanying safety contact edge CLOSE was activated
86	Number of revisions	The maximum number of revisions for a movement direction (without reaching the end position) was reached
130	SKL.OPENTstErr	Erroneous test results for the stationary safety contact edge OPEN were detected
131	SKL CLOSE TstErr	Erroneous test results for the stationary safety contact edge CLOSE were detected
197	START	Program restart
201	ROM error	The motor controller detected a program memory error (fatal exception error)
202	EEPROM Err	An error occurred while accessing the EEPROM (can sporadically occur directly after a reset)
203	StackReg.Err	The motor controller detected a memory stack error (fatal exception error)
204	StackErr:low	The motor controller detected a memory stack error (fatal exception error)
205	StackErr:high	The motor controller detected a memory stack error (fatal exception error)
206	WdgErr:low	The motor controller detected watchdog error (fatal exception error)
207	WdgErr:high	The motor controller detected watchdog error (fatal exception error)
208	Watchdog error	The motor controller detected watchdog error (fatal exception error)
209	WDG Reset	The motor controller was restarted by the watchdog
210	MotRuntimeErr	Motor movement was stopped because the maximum motor runtime for this gate movement was reached (end switch was not reached in the max. time) [Gate check required]
211	main-cntErr.	The motor controller's main loop counter was overrun (fatal exception error)
212	Undef. Stat.	The variable for status automation reached an invalid value (fatal exception error)
213	EndSwitErr	The end switch was not left within the maximum permitted time (4 sec.) (Gate disengaged or very sluggish) [Gate check required]
214	< Maintenance > required	One of the specified maintenance events (gate cycles, maintenance interval) has been reached
217	EEPR.Err.Txt	The desired display text was not found in the memory
218	EEEPR.Err.Write	An error occurred while writing a text in the memory
219	EEPR.Err.Language	An error with the pointer address occurred for a text in the memory

220	MotorErr.	Motor movement was stopped due to a motor monitoring signal
225	FU Fault Err	The frequency converter's power component detects a high motor current
226	FU Temp.Err	The frequency converter module detects a high operating temperature
228	REL+Err.High	The voltage monitoring for the release signal measured a value that was too high
229	REL+Err.Low	The voltage monitoring for the release signal measured a value that was too low
230	REL+Err.Idl	The voltage monitoring for the release signal measured a value that was too high for the open-circuit voltage
236	Reference active	A gate reference run was activated
238	OPEN/CLOSE- start active	The motor controller's program start was interrupted due to an active movement command (check and deactivate inputs)
239	LightBarrTestErr	There was an error in the light barrier test
241	SPI BCC Err	A checksum error occurred during communication between the controllers
242	SPI ID Err	A data error was detected during communication between the controllers
243	ParameterErr	An error occurred while writing data in the memory
247	VariantErr	The loaded parameter set and motor controller program variant do not go together
248	Param.LoadErr.	An error was detected while transmitting the parameter set from the peripheral controller to the motor controller (CRC16 checksum)
249	Menu pointer Err	Menu program pointer error (error in the branching of the menu structure)
250	Programlnit.	In the system log: The program was initialized (deletion and initiation of parameter memory) In the event log book: The program was restarted (e.g. rest via menu END)
253	RESET	Program triggers a software restart

## **7. Maintenance instructions**

The control system 6040-FR itself is maintenance-free. The overall gate system must be regularly checked in accordance with DIN EN 12453. The operator is informed of this necessary maintenance by the control system software with the message

Maintenance necessary
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on the display.

## 8. Technical data

<b>6040-FR</b>	
<b>Electrical values</b>	
Voltage supply	1 Phase 230 VAC / N / PE ±10 % 50/60 Hz
Factory protection fuse	max.10 A
Power consumption (without motor or external consumers)	16 W
External power supply 230 V	230 VAC ±10 % 50/60 Hz protected on the circuit board with 6.3 A delay
External power supply 24 V	24 VDC stabilized (±5 %) max. 500 mA (protected with self-resetting semiconductor fuse)
Control inputs	24 VDC / typically 4 mA < 12 V: inaktive -> logical 0 > 18 V: aktive -> logical 1 (internally galvanically separated)
Relay outputs1	max. 250 VAC / 1 A
Maximum motor capacity	0,55 kW / 7 Hz ... 50 Hz
<b>Mechanical values</b>	
Housing	ABS with aluminium cooling element
Dimensions W x H x D	160 x 270 x 110 mm
Weight	2,3 kg
Protection class	IP54
Temperature range	-20 °C to +55 °C
Humidity range	max. 99 % non-condensing