Installation and Operating Instructions

Non-contact Flange Detecting System FA II

FA II Installation and Operating Instructions

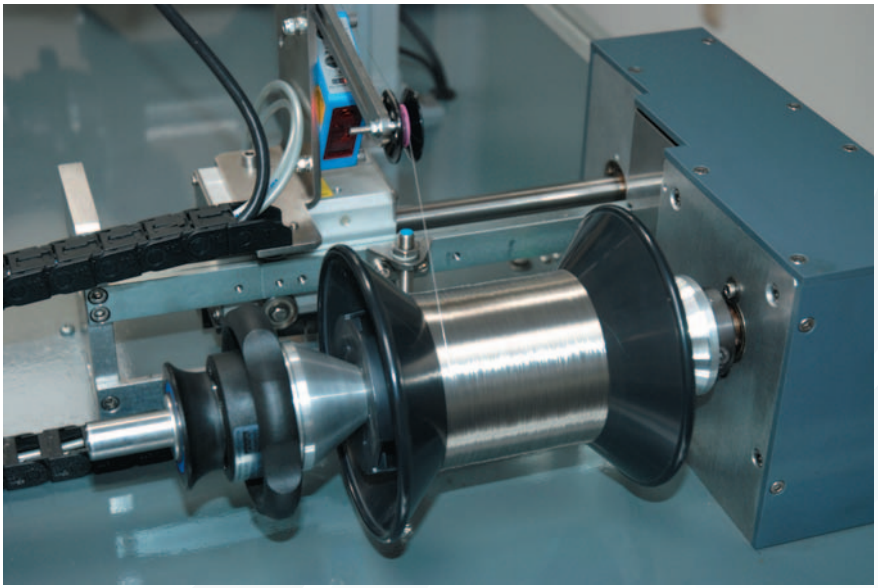
Contents

General

Application

The flange detecting system detects the position of flanges on spools, regardless of the spool used. After a spool change, the system automatically adjusts to the new spool position and, where necessary, the new spool shape. The flange detecting system was specially designed for application with pneumatically reversible rolling ring drives but can also be fitted on other traversing systems after testing.

Principle of function

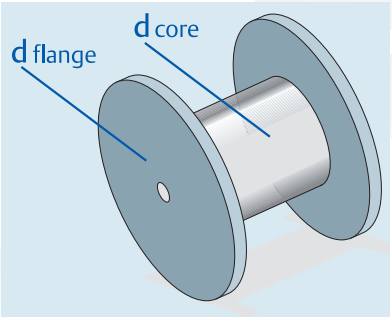


The sensor detecting the flange is mounted on the traversing system. At a defined point, the current distance is captured and saved as reference distance for each single layer. While the traversing system moves, the reference distance is continuously compared to the measured value.
A reversal is triggered as soon as the permissible, adjustable height deviation is exceeded. Such a height deviation occurs when the flange or an accumulation of material on the spool is detected.
A display indicates either the measured height or the permissible height deviation.

Areas of application

The system has been designed for laying round material with diameters of 0.1 to 2 mm on cylindrical spools. Other dimensions are possible after consultation.

Spools of different sizes can be wound without readjustment because the reference distance is measured for each single layer. In this context, the diameters of the spool core (d_{core}) and the flanges (d_{flange}) must be heeded. The difference must not exceed 220 mm ($d_{flange} - d_{core} < 220$ mm).



When using several spools, the smallest core diameter and the largest flange diameter applies. If K160 spools with 160 mm flange and 100 mm core diameter and K 40 spools with 40 mm flange and 25 mm core diameter are used, the flange diameter of the K160 spool (160 mm) and the core diameter of the K40 spool (25 mm) must be applied.
The calculation is as follows: 160 mm - 25 mm = 135 mm; therefore, the difference is much less than the permitted 220 mm.
Please heed chapter “Flange detecting sensor” to define the distance between sensor and winding unit.
Other spool sizes are possible as variant.

Flanges can be rectangular, or conical up to an angle of ≥ 40°. The bulging of flanges is compensated for. Scanning of spools with collapsed flanges is not possible.
The traversing system must be mounted parallel to the spool axis. For very slow winding speeds, the axial run-out of the shaft carrying the spool should not be smaller than the smallest diameter of the material to wind.

Proper functioning of the traversing system is a prerequisite for proper functioning of the flange detecting system. The flange detecting system is based on a highly resolving measuring system, which requires the sensors to be precisely guided and adjusted.

Installation of optional components is also described.

Scope of delivery

The flange detecting system comprises:

- 1 sensor for flange detection, with 3.5 m connecting cable, pluggable
- Holder for flange detecting sensor to which a guide system adapted to the rolling ring drive can be mounted, universally applicable
- Energy chain for hoses and cables
- 1 sensor for reference point detecting with 2 m connecting cable
- Universal holder for reference point detecting sensor
- 1 switch box with controller, display, reset pushbutton, adjuster for permissible height deviation
- Installation and Operating Instructions

The following components can be present as option:

- Protective sensor enclosure, comprising:
    - enclosure
    - compressed air connection with restrictor
    - fastening material
- Pneumatic kit, comprising:
    - fast-action valve
    - valve bracket
    - hoses
- Guide system, comprising components of our GS range.

Used pictograms

Caution

Warns you of installation and operation errors that can lead to system damage, and indicates safety-related operating situations.

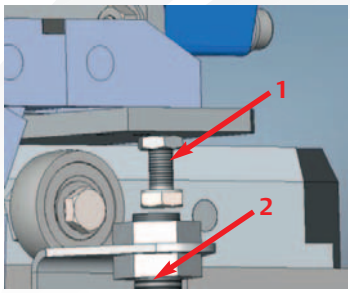
Note

Provides information on optimal installation and operation of the system and identifies potential sources of error.

Installation and adjustment

The installation instructions are intended for subsequent installation of the FA II on existing drives. Most components are already mounted when a new drive comes with an FA II installed. Check the adjustment before commissioning because transport may have caused changes.

Sensor for reference point detecting

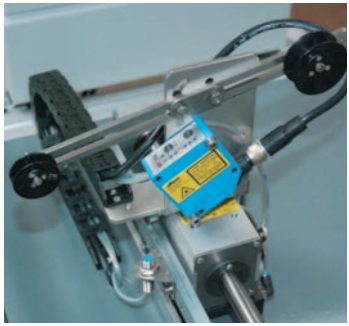


Fasten the sensor (2) with a bracket to the rail of the anti-twist device. Make sure the protection against torsional strain of the rolling ring drive moves freely. The sensor can be mounted to the rail in different positions. Choose a position where the sensor is actuated only when the material guide and consequently the distance sensor are above the spool, and not above the flange. When different spools and flange shapes are used, the position must be checked for all spool types. Set a distance of 0.5 to 1.0 mm between sensor (2) and actuator (1). The sensor has a LED that indicates an actuation.

⚠ Lock the actuator screw (1) with the lock nut! Heed the maximum permissible tightening torque of 4 Nm for the sensor nuts.

Flange detecting sensor

Use the universal holder to mount the sensor. The sensor can be mounted below or above the material guide. The sensor beam must hit the centre of the material guide. The material to wind must not interrupt the beam during winding! The connector at the sensor can be turned by 180° to optimise cable routing. Make sure not to kink the cable, and heed the minimum bending radius. When using the protective enclosure, mount the sensor according to the enclosed drawing.



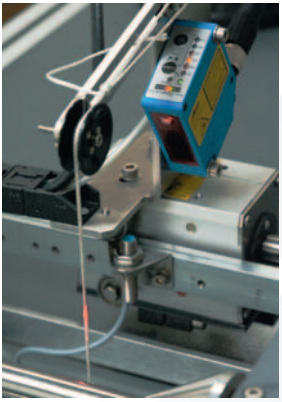
Energy chain

Mount the energy chain according to the illustration and make sure it runs freely. The energy chain can be mounted to the left and also to the right.
Secure the cable and the hoses to the rolling ring drive.

Do not change sensor parameters or make any settings with the push-buttons of the sensor. The sensor is operated with the factory settings. Replace a defective sensor with a new one without changing any settings.
Settings made on the control panel of the sensor will result in incorrect measurements, and proper system function can no longer be guaranteed. We recommend disabling the sensor buttons. To do so, press the "Set" button on the energised sensor for at least 5 seconds.

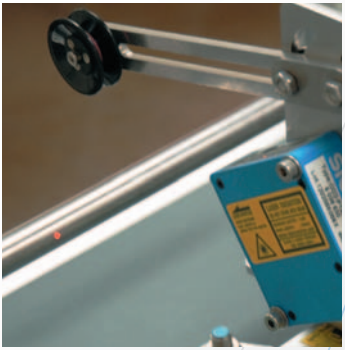
The unit features a Laser Class II device acc. to IEC 60825-1. The responsible supervisor is obliged to ensure compliance with applicable rules and regulations! To switch off the laser beam due to operational reasons, a + 24 VDC signal (grey wire of sensor cable WB2) must be applied. When doing so, make sure the traversing unit does not move.

Align the beam of the sensor at a right angle to the traversing unit axis.
Also align the material guide at a right angle to the traversing axis. The beam of the sensor and the material guide must be arranged precisely above each other. To adjust, suspend a plumb line above the material guide; the beam of the sensor must hit the plumb line.



The sensor distance to the holder changes when the sensor is mounted in a protective enclosure. In this case, the material guide must be adapted, e.g. by replacing the spacer sleeves on the guide rollers.

Adjust the sensor height so it matches the shaft centre of the spool axis. To facilitate alignment, a piece of adhesive tape can be stuck to the shaft.
The distance between the sensor and the smallest spool used must not exceed 175 mm. The flange of the largest spool must not be closer to the sensor than 65 mm.



Check and if necessary correct the adjustment if the traversing unit is changed mechanically. When spools smaller than those used so far are applied, compliance with the Installation and Adjustment Instructions must be ensured.

Electrical connections

The switch box requires a 24 VDC supply. Make sure to establish proper earthing. Connect reference sensor B1 and sensor B2 for surface scanning to the switch box acc. to the wiring schematics.

For reversal as such, the signals “flange pulse detected”, “counter clockwise” and “clockwise” are available. When the machine controller is to process the signals, proper electrical isolation must be ensured by implementing coupling relays in the machine controller.

The signal “flange pulse detected” (output Q0.2) is available for 0.5 sec when a flange was detected. This signal can be used to control a machine, for example. Output signals “counter clockwise” (output Q0.0) and “clockwise” (output Q0.1) exclude each other. These signals are preferably used to control valves. When the signal “counter clockwise” is active, and the system detects a flange, the “counter clockwise” output is disabled, and the “clockwise” output is enabled. When a 5/2 valve, e.g. from the optional “Pneumatics” kit is used, connecting a single valve is sufficient. This should be connected to the “clockwise” output preferably. When the pivot lever of the rolling ring drive is set to “clockwise” and the valve is triggered (indicated by the yellow LED in the valve connector), the rolling ring drive must move to the right while the shaft rotates. When it moves to the left, swap the pneumatic hoses.

Make sure during commissioning that the pivot lever points to the direction of motion.

The “error” output signal is active during normal operation. The output is deactivated when the internal fuse drops out or a controller fault occurs.

The controller features an input to where an external reset signal can be connected, e.g. the ON button of the machine. The function is described in chapter “Operation”. The signal must be a floating pulse.

Pneumatic connection, pneumatics option and protective enclosure

The valve should be installed as close to the traversing unit as possible. Fit the locking screw on the valve connector. To ensure fast switch-over, a sufficient supply of compressed air, kink-free hoses and an unobstructed exhaust air path are essential.

The protective enclosure for the sensor features a compressed air connection with restrictor. Air can be injected into the enclosure to protect the sensor from dust ingress. As a rule, a very small volume of air is sufficient. Match the air volume to the ambient conditions. The sensor must nevertheless be checked for soiling and cleaned if applicable. An oil separator may be required if there is much oil in the air.

System operation

The system requires little operation only. The controller continuously captures the changing coil diameter, thus adapting the evaluation of the measurement results.

Controls

The switch box has a “reset” pushbutton, an “adjust” pushbutton switch, a “-/ +” selector, and a display.
The display indicates the current height measurement in mm with one decimal place. The displayed value equals the difference to the reference distance. A positive value indicates a build-up of material, a negative value indicates a lower coil height than at the reference point. Actuate the “adjust” pushbutton switch to display the set permitted height deviation.
The “reset” pushbutton must be pressed before the machine starts after a coil change. In this context, it is vital that the sensor is not positioned on the spool flange but between the flanges. When the start pushbutton of the machine is connected to the reset input of the controller, (see chapter “Electrical connection”), the “reset” pushbutton need not be pressed.
Pressing the button during operation can result in a malfunction!

The “adjust” pushbutton switch is not actuated during normal operation. When the switch is actuated, the permissible height deviation id indicated in the display and can be adjusted. To do so, set the selector to “-” or “+” to automatically increase or decrease the value. The smallest value to set is 0.1 mm. The smaller the value, the more sensitive is the reaction of the system to height differences. Too low a setting can result in malfunctions with poor material guidance, heavily deformed spools or poor parallelism between traversing unit and spool. For spools with straight flanges, a value corresponding to the 3 to 5 fold of the wire diameter should be chosen whereas a 2 to 4 fold value should be chosen for conical spools and spools with heavily deformed flanges. For conical spools with flat flanges, a value corresponding to the 2 to 3 fold of the wire diameter should be chosen. The following applies in this context: the larger the value, the less sensitive is the system to mechanical flaws such as missing parallelism between traversing system and winder. The smaller the value, the more precisely does the system detect the reversal point. This is especially important with conical flanges. These are approximate values that must be verified and, where necessary, corrected during operation.
The permissible height deviation can also be changed during operation.

Commissioning
After installation and adjustment of the components and switching on the energy supply and the compressed air, the function can be tested. First, set the permissible height deviation at the switch box, see chapter Controls. Insert a spool into the winder. Now set the release lever of the rolling ring drive to “0” and actuate the “reset” pushbutton. Then move the rolling ring drive on the shaft until one flange enters the detection range. When the permissible height difference is exceeded, the controller must reverse the traversing system.

The system also allows the parallelism of traversing unit and winder to be to tested. To do so, insert a spool into the winder, move the traversing unit into the vicinity of the left flange and actuate the “reset” pushbutton. Now set the release lever of the rolling ring drive to “1”, start the traversing unit without material and stop it right before it reaches the right flange. When the display indicates a negative value, the right side of the traversing unit is farther away from the spool than the left side by this value, and contrary in case of a positive value.
The deviation for spools featuring straight flanges should not be greater than the 3 fold wire diameter in case of thin wires, and not greater than the 2 fold wire diameter in case of thicker wires. For conical spools, the deviation should not exceed twice the wire diameter.

Troubleshooting
1. One side of the spool is not filled or filled sporadically only.
➙ *The shafts or spool and traversing unit are not parallel to each other.*
- Realign the traversing unit.
- Increase the permissible height deviation; this may result in a poorer winding pattern on conical spools or spools with bulging flanges.
- Replace the actuating screw for the reference sensor with a rail. No reversal takes place as long as the sensor is activated.
  When spools of different sizes are used, the smallest spool width and position apply.

2. Material builds up at the flanges.
➙ *Reversing takes too long.*
- Check the air lines when pneumatic reversing is used:
  free air passage in the lines, lines not kinked, use of quick-action valves ($t < 2$ ms), unobstructed exhaust air path, sufficient supply air flow
- When electrical reversing is used: check switching elements and reversal reaction times.
- When electrical reversing is used: Check switching elements and reversal reaction times.

➙ *Incorrectly set reversal point.*
- Reduce permissible height deviation

➙ *Incorrectly set traversing unit*
- Reduce the pitch of the traversing unit. The minimum interval between two reversing actions is 3 seconds. When small spools are wound at a high traversing speed, the opposite flange can be reached before the delay time has expired.

➙*Too high tension forces in the material*
- Check tension force

➙ *When material builds up on one side:*
- Check the alignment of the sensors for flange detecting.
- Align the sensor to the centre of the spool receptacle axis.
- The sensor must be aligned parallel at the height of the material guide.
- Check that material guide and sensor are installed at right angles to the traversing unit.
- Check material guide
- Has the selected guide been matched to the material to wind?
- Is the distance between guide and spool too great?

3. Fast switching sequence without obvious reason

➙ *No signal from reference sensor.*
- Check adjustment of sensor and actuator screw
- Check the sensor function, also the LED at the PLC input. The LED at the PLC input must light up only when the sensor is actuated by the switching lug.

Technical data

- Supply voltage: 24 VDC, 2 A
- Ambient temperature range -10 ° to 40 °C, humidity 95%, non condensing
- Protection class of flange detecting sensor: IP 65
- Switch box: Dimensions (w x h x d): 300 x 200 x 120 mm, cable exit at bottom, d+30 mm for controls; vertical installation; IP54 protection, IP65 upon request
- 2 shielded valves, 24 V, 0.4 A, can be connected, see Options
- Signals for machine control and alarm indication: flange pulse detected, counter clockwise, clockwise, error; switching capacity per output: 24 VDC, 0.4 A per channel, total: 1.2 A
- Flange detecting sensor: Laser Class II acc. to IEC 60825-1

Maintenance

The system is maintenance-free; in dust-laden atmospheres, the aperture of the flange detecting sensor should be cleaned from time to time, or a protective enclosure should be used.

Options

- Protective sensor enclosure with compressed air connection as cleaning device and pressure governor unit
- Pneumatic kit, consisting of fast-action valve, mounting bracket, connecting cables and hoses; p_{min} = 6 bar, quality acc. to ISO 8573-1:2010
- Guide system from our GS range
- Installation and commissioning support

Worldwide

The adresses of our agencies are available in the internet:
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HaFA 07/2018

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