SEW EURODRIVE

Addendum to the Catalog

Diagnostic unit /DUE for function and wear monitoring of brakes BE.., BF.., BT..

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1. Description

The diagnostic unit /DUE (Diagnostic Unit Eddy Current) is an option for DRN.. motors with brake. It is designed for industrial use and is used for monitoring the maximum working air gaps of SEW brakes of type BE.. and double brakes of type BF../BT.. from SEW-EURODRIVE.

The diagnostic unit /DUE consists of:

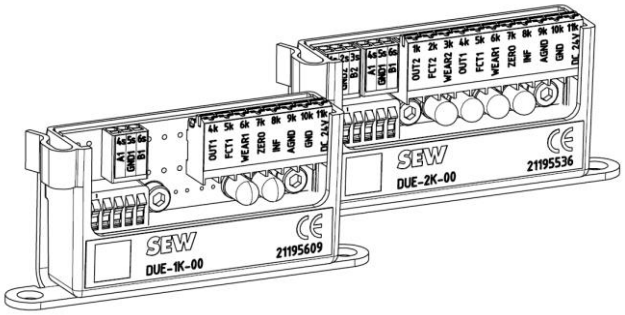
- Evaluation unit in the motor terminal box that is supplied via a 24 V DC voltage.
- 1 sensor, installed in the magnet body of brakes BE1 to BE122
- 2 sensors, installed in the magnet bodies of double brakes BF/BT11 to BF/BT30

1.1. Evaluation unit

The evaluation unit is available in 2 versions:

DUE-1K: Single-channel version for BE.. brakes (see figure on left)

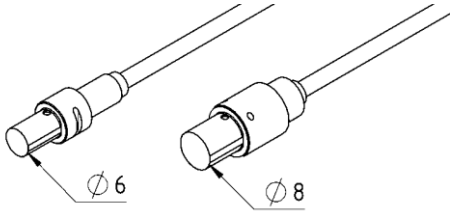
DUE-2K: Two-channel version for BF../BT.. brakes (see figure on right)



1.2. Sensors

DUE-d6: Diameter 6 mm for BE1 - BE5 (see figure on left)

DUE-d8: Diameter 8 mm for BE11 - BE122, BF/BT11-BF/BT30 (see figure on right)



This document primarily describes the diagnostic unit /DUE for use with the BE.. brake. Additional information has been included in order to also provide an overview of use with the BF../BT.. double brake.

2. Features

The most important characteristics are listed below:

- 2 digital output signals (DC 24 V):
- 1 digital output with NO contact function as function monitor for the brake: Detection of the correct brake function (brake released/engaged)
- 1 digital output with NC contact function as wear monitor for the brake: Detection of the maximum brake wear limit (working air gap OK/too big)
- A current signal (4 … max. 20 mA) proportional to the air gap.
- The sensor is integrated in the coil body.
- LEDs in the evaluation unit signal the status of the digital outputs.
- The evaluation unit (electronics) is always installed in the terminal box, and takes on the degree of protection of the overall drive.
- The degree of protection of the sensor is IP66, meaning that IP66 can be offered as the overall degree of protection for the drive.
- Detection of brake pad wear and the function of the brake is contactless and hence wear-free.
- The diagnostic unit /DUE is supplied in the brake motor fully assembled and calibrated.
- DIP switches for setting the sensor size and the maximum permissible wear limit, for optimum adaptation to the application in conjunction with condition monitoring.
- In the event of a change of pad carrier or air gap adjustment in the event of wear, no recalibration of the eddy current sensor is necessary, since the installation environment of the sensor does not change.
- Subsequent shortening of the connection cable between the evaluation electronics and the sensor and replacement of the sensor, the evaluation electronics, the magnet body or the pressure plate always requires recalibration of the evaluation electronics.
- Connection variants
- Directly via cage clamp terminal
- Connection via M12 connector (4-pin or 8-pin) is in preparation.
- The diagnostic unit can be retrofitted (in preparation, please contact SEW-EURODRIVE).

2.1. Functional description

The diagnostic unit /DUE (Diagnostic Unit Eddy Current) is a contactless measuring system for function and wear monitoring of the brake and continuous measurement of the current working air gap.

It is a contactless measuring system, based on the eddy current principle. A high-frequency alternating current flows through the sensors. The electromagnetic field induces eddy currents in the pressure plate that change the alternating current resistance of the sensor. The evaluation unit converts this change in impedance into an electrical signal (4 – 20 mA) that is proportional to the working air gap of the brake.

The function of the brakes is monitored via digital signals (NO contact). The reaching of the wear limit is signaled by digital outputs (NC contact). Furthermore, current outputs allow the wear of the brake to be continuously monitored. In addition to the outputs, LEDs at the evaluation unit indicate the function and wear of each partial brake.

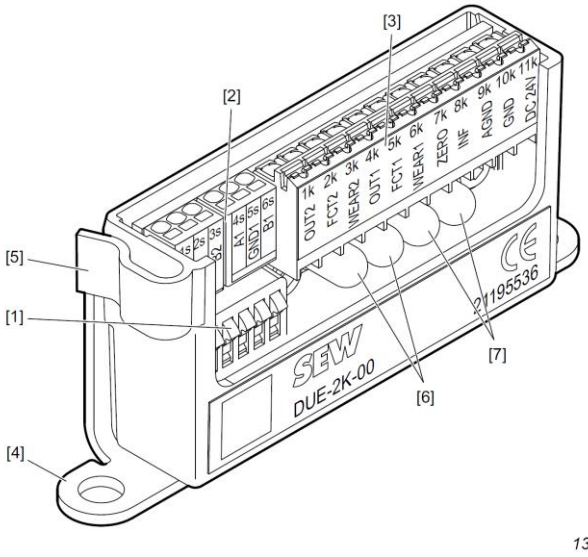
– 1 or 2 red LEDs indicate the state of wear of the respective partial brake

– 1 or 2 green LEDs indicate the function of the respective partial brake

Further diagnosis can also be carried out using the various light codes of the LEDs.

If the brake is ordered in combination with the diagnostic unit /DUE, the function and wear monitoring function is already installed, calibrated and set to the permitted wear limit for the brake in the factory.

2.2. Meaning of the LEDs



LEDs	Designation	Description
Green [6] *	FCT2	Partial brake II is open. Electromagnet is active. Pressure plate is in contact with magnet body.
Red [6] *	WEAR2	The current working air gap of partial brake II has reached or exceeded the preset maximum working air gap.
Green [7]	FCT1	Partial brake I is open. Electromagnet is active. Pressure plate is in contact with magnet body.
Red [7]	WEAR1	The current working air gap of partial brake I has reached or exceeded the preset maximum working air gap.

* only with DUE-2K-00 in conjunction with double brake BF../BT..

2.3. Designations of the terminals

Connection of the sensors [2]

Terminal	Designation	Description	Color coding
1s *	A2	Sensor 2 connection 1	Brown (BN)
2s *	GND2	Sensor 2 shield	Black (BK)
3s *	B2	Sensor 2 connection 2	White (WH)
4s	A1	Sensor 1 connection 1	Brown (BN)
5s	GND1	Sensor 1 shield	Black (BK)
6s	B1	Sensor 1 connection 2	White (WH)

* only with DUE-2K-00 in conjunction with double brake BF../BT..

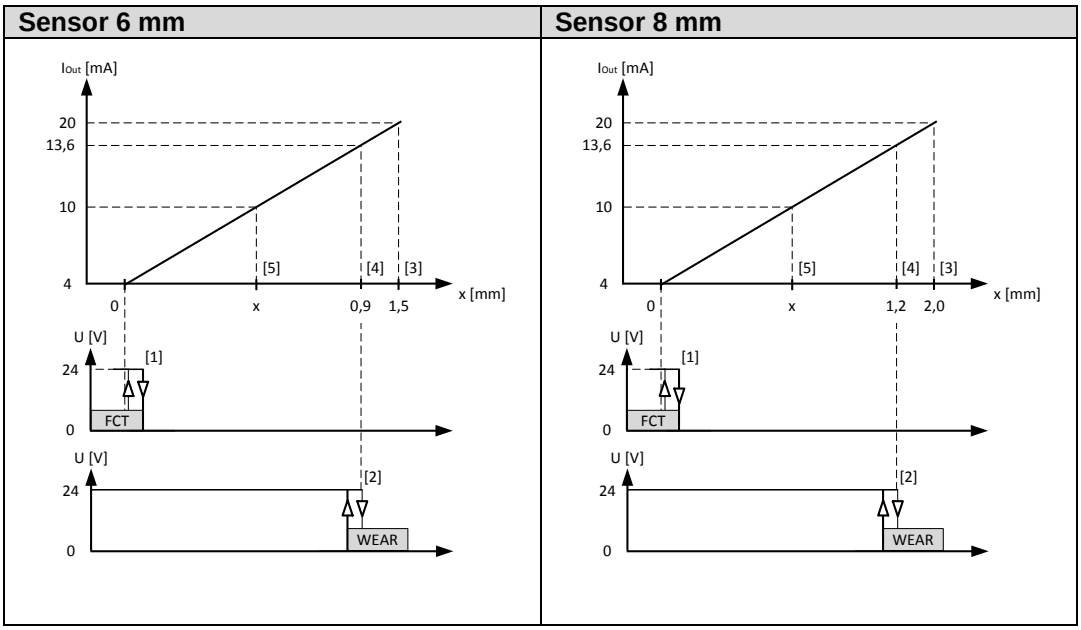
Connection at customer end [3]

Terminal	Designation	Description
1k *	OUT2	Analog output, partial brake II working air gap (4 – 20 mA)
2k *	FCT2	Digital output, partial brake II function (NO contact)
3k *	WEAR2	Digital output, partial brake II wear (NC contact)
4k	OUT1	Analog output, partial brake I working air gap (4 – 20 mA)
5k	FCT1	Digital output, partial brake I function (NO contact)
6k	WEAR1	Digital output, partial brake I wear (NC contact)
7k	ZERO	Input, zero value calibration
8k	INF	Input, infinite value calibration
9k	AGND	Signal ground AGND
10k	GND	Ground potential GND
11k	24 V DC	24 V DC supply

* only with DUE-2K-00 in conjunction with double brake BF../BT..

2.4. Output signals for function and wear monitoring

The figure shows the generation of the switching states on the example of the single-channel version of the diagnostic unit /DUE, depending on the brake size or sensor and the amperage as a function of the air gap.



[1] FCT: Digital output function (DC 24 V, DIN EN 61131-2)

[2] WEAR: Digital output wear (DC 24 V, DIN EN 61131-2)

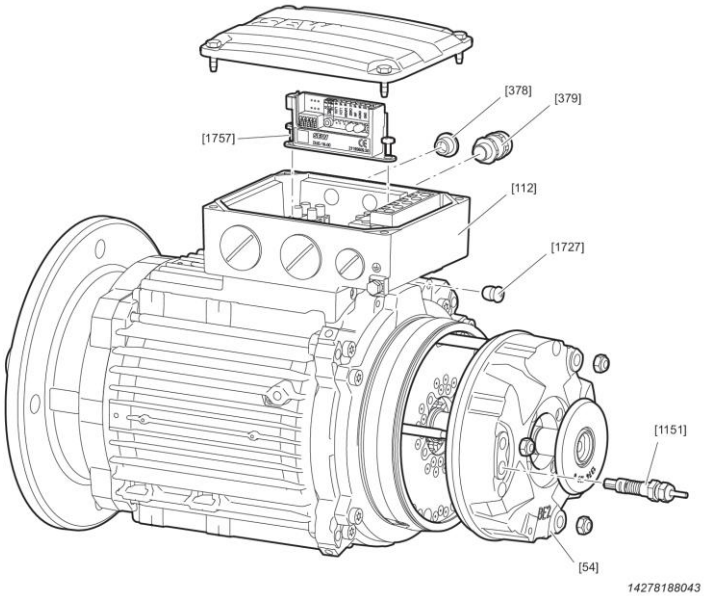
[3] Measuring range of sensor

[4] Max. working air gap of brake

[5] Currently measured working air gap (exemplary)

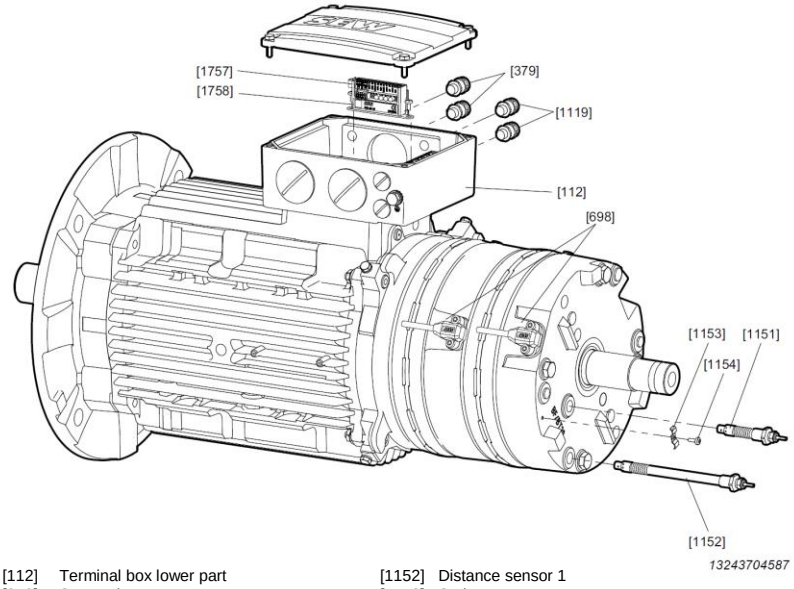
3. Motor structure with diagnostic unit /DUE

3.1. DRN.. with BE..



[54] Magnet body
[112] Terminal box lower part
[378] Screw plug
[379] Cable gland
[1151] Sensor
[1727] Grommet
[1757] Evaluation unit

3.2. DRN.. with BF../BT..



[112] Terminal box lower part
[379] Screw plug
[698] Complete plug connector
[1119] Screw fitting
[1151] Distance sensor 2
[1152] Distance sensor 1
[1153] Spring
[1154] Flat head screw
[1757] Evaluation unit
[1758] Retaining screw

4. Technical data

Evaluation unit			DUE-1K-00 for brake BE..	DUE-2K-00 for brake BF../BT..
Part number			21195609	21195536
Signal outputs (2 channels)			BE.. brake Out1: 4 – 20 mA FCT1: DC 24 V (150 mA) WEAR1: DC 24 V (150 mA)	Partial brake 1 for brake BF../BT.. Out1: 4 – 20 mA FCT1: DC 24 V (150 mA) WEAR1: DC 24 V (150 mA) Partial brake 2 for brake BF../BT.. Out2: 4 – 20 mA FCT2: DC 24 V (150 mA) WEAR2: DC 24 V (150 mA)
Current consumption	Max.	mA	190	360
	Min.	mA	40	80
Supply voltage			DC 24 V (± 15 %)	
Electromagnetic compatibility			DIN EN 61800-3	
Operating temperature range of evaluation unit			-40 to +105 °C	
Humidity			≤ 90% RH	
Degree of protection			IP20 (in closed terminal box max. IP66)	

sensors	Ø 6 mm	Ø 8 mm
	DUE-d6-00	DUE-d8-00
Measuring range (MB) in mm max.	1.5	2.0
Degree of protection	IP66	IP66
Operating temperature range of sensor and cable	-50 to +150 °C	-50 to +150 °C

Max. ambient temperature of brake motor with diagnostic unit /DUE

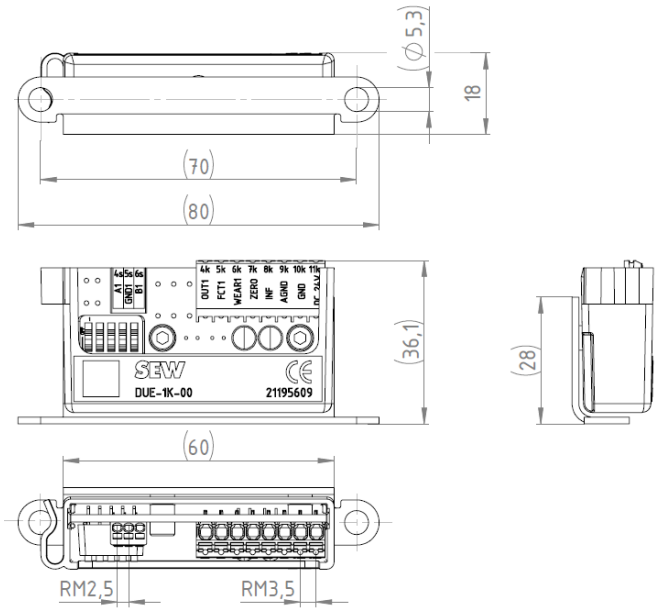
The standard temperature range is -20°C to +40°C. Temperature ranges up to +60°C are also possible; this is dependent on the thermal load and the use of other options that have an influence on the thermal behavior of the motor.

Temperature ranges down to max. -40°C are also possible.

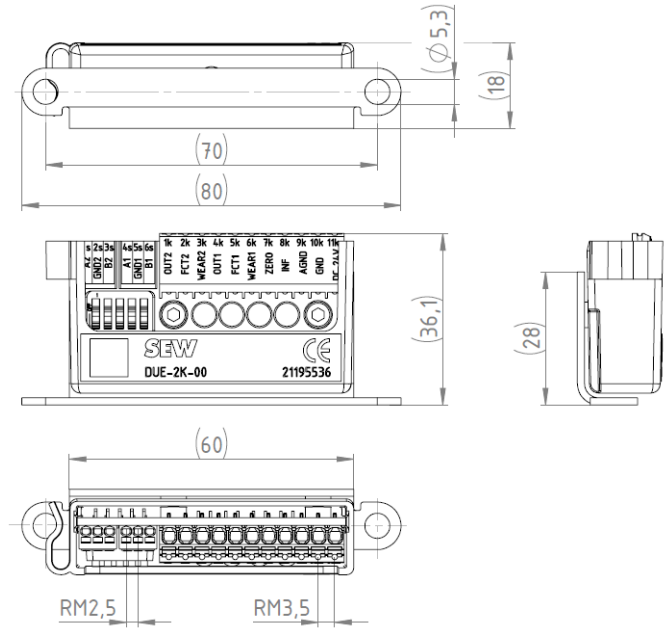
5. Dimensions

All dimensions are in mm.

5.1. DUE-1K-00



5.2. DUE-2K-00



6. Connection of the diagnostic unit

The function and wear monitoring is connected according to the following wiring diagrams in the wiring diagram shown in chapters 6.2 and 6.3.

The maximum permitted cable cross-section at terminals "[k]" is 1.5 mm² with conductor end sleeve without plastic collar, 0.75 mm² with plastic collar.

The recommended cable cross-section at terminals "[k]" is 0.5 mm² with conductor end sleeve with plastic collar.

INFORMATION

SEW-EURODRIVE recommends the use of a shielded line when wiring.

In environments that are particularly interference-intensive, SEW-EURODRIVE recommends the use of a shielded cable to the evaluation unit for monitoring the analog signals. Connect one end of the shield to GND.

If the diagnostic unit /DUE was ordered with the brake, the function and wear monitoring is preinstalled and calibrated in the factory. The customer connection still needs to be made, see wiring diagram.

Information about operating instructions "AC motors - DR..71 – 315, DRN80 – 315":

If the diagnostic unit /DUE is retrofitted, observe chapter "Retrofitting the diagnostic unit /DUE for function and wear monitoring".

The switching point of the wear monitoring is preset to the maximum permitted value for the brake in the factory. According to the "code table", a reduced value can also be set.

The status of the evaluation unit can be found in chapter "Status message of the evaluation unit".

6.1. Recommended connection technology for the motor connection

Observation of the following points ensures the functionality of the diagnostic unit:

Assembly with connection unit:
Use of a standard cable and feeding through into the terminal box via a cable gland.

Important characteristics of the bulk cable to be used:

- Total shielding (outer shield) of the cable
- 100 m maximum length for fixed installation
- 50 m maximum length for cable carrier installation

Use of lines with

- 3 cores: Function or wear; [FCT/WEAR, +24 V, GND] or
- 4 cores: Function and wear [FCT, WEAR, +24 V, GND] or analog air gap signal [OUT, +24 V, AGND, GND] or
- 6 cores: Function and wear and analog air gap signal [OUT, FCT, WEAR, +24 V, AGND, GND]);
- 11 cores: all signals with calibration
- In order to make calibration via a PLC possible, inputs INF and ZERO and the AGND signal must be led to the outside. The inputs must be routed to AGND during normal operation.
- GND and AGND have the same potential. If this potential is not dealt with separately in the application, AGND is not necessary.
- With double brake BF../BT.., the FCT, OUT and WEAR signals are doubled.

INFORMATION

We recommend routing the power cable of the drive and the cable of the diagnostic unit separately.

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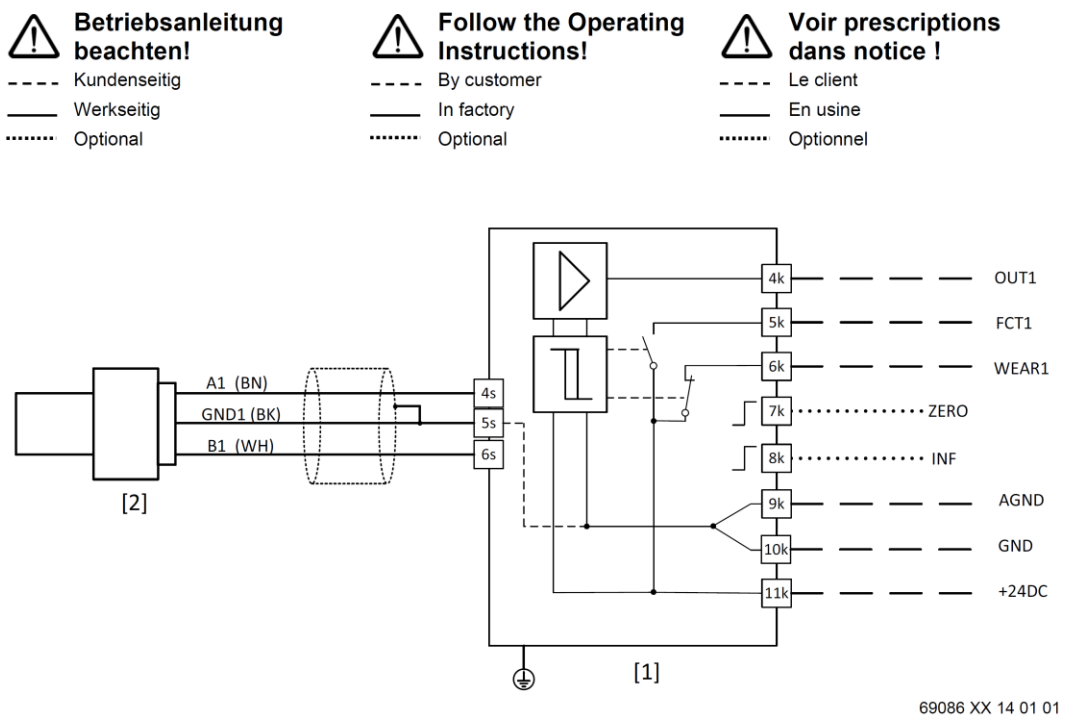
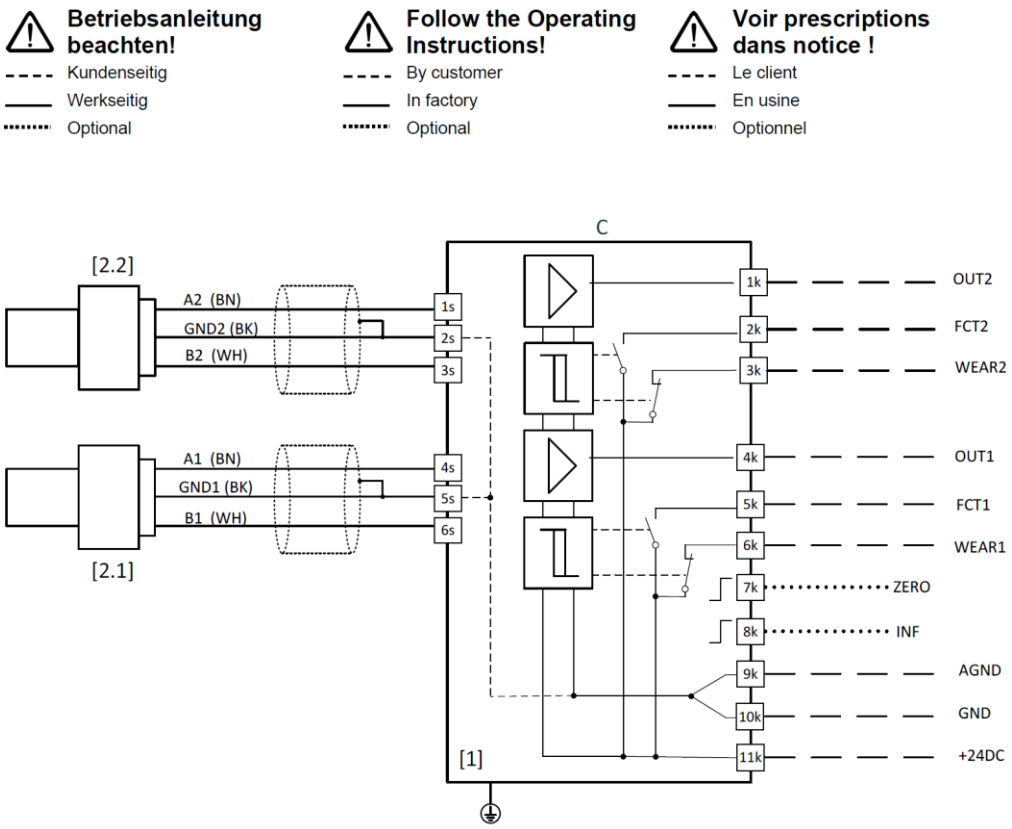
6.2. Block diagram of the diagnostic unit /DUE for type BE.. brakes



[1] Evaluation unit

[2] Sensor

6.3. Block diagram of the diagnostic unit /DUE for type BF../BT.. brakes

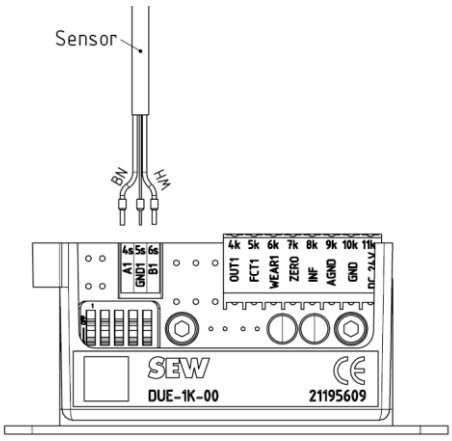


[1] Evaluation unit

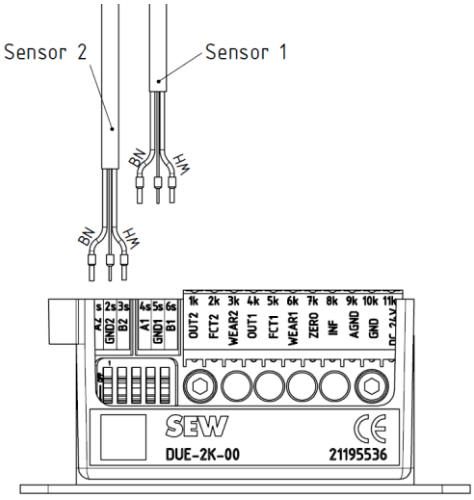
[2.1] Sensor 1

[2.2] Sensor 2

6.4. Connecting the sensors



With brake BE..

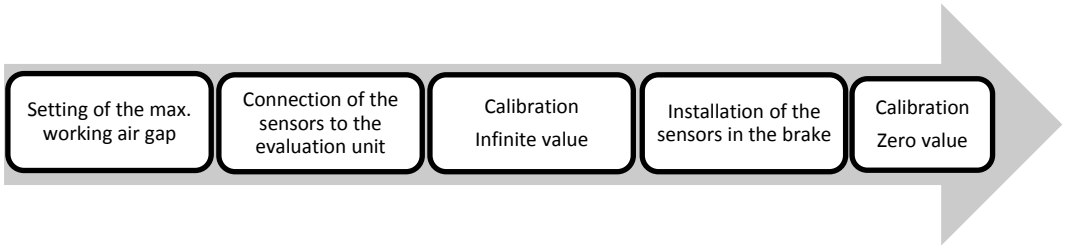


With brake BF../BT..

7. Setting and installing the evaluation unit

If the diagnostic unit /DUE option has been ordered, function and wear monitoring is installed and calibrated in the factory. The customer connection still needs to be made, see wiring diagram. The diagnostic unit is now ready for operation.

If the option is retrofitted, various settings need to be made.



All work is described in detail in the respective operating instructions.

8. Notes

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