

# Application Note

## Installation of linear and rotary motion transducers

### Introduction

This application note describes installation of the linear and rotary motion transducers to circuit breakers. The motion measurement of circuit breakers movable parts is available on the following DV Power Circuit Breaker Analyzers and Timers: CAT34, CAT35, CAT64, CAT64A, CAT65, CAT66, CAT124A, CAT125 and CAT126 (in further text referred to as "CAT").

CAT devices support both linear (analog) and rotary (digital) transducers:

- CAT34, CAT64 have one transducer input.
- CAT35, CAT64A, CAT65, CAT124A, CAT125, CAT126 have three transducer inputs.

Implementation of CAT and motion transducers provides checking of the circuit breaker's complete operating mechanism and mechanical linkage. The following parameters can be obtained: average velocity (which is calculated based on the main contact's defined travel distance over a period of time), total-travel, over-travel, rebound, contact wipe, damping time and distance etc. These results can be compared to the manufacturer's reference data and information acquired by previous measurements. This provides indications about potential wear of the circuit breaker movable parts.

### Linear transducer installation

DV Power recommends the following sets of linear (analog) transducers with different strokes and cable lengths:

Table 1. Linear (analog) transducers

Article	Article number
Linear Analog Transducer 150 mm with 5 m connection cable	LAT-150-C305
Linear Analog Transducer 150 mm with 10 m connection cable	LAT-150-C310
Linear Analog Transducer 225 mm with 5 m connection cable	LAT-225-C305
Linear Analog Transducer 225 mm with 10 m connection cable	LAT-225-C310
Linear Analog Transducer 300 mm with 5 m connection cable	LAT-300-C305
Linear Analog Transducer 300 mm with 10 m connection cable	LAT-300-C310
Linear Analog Transducer 500 mm with 5 m connection cable	LAT-500-C305
Linear Analog Transducer 500 mm with 10 m connection cable	LAT-500-C310



Figure 1. Linear Analog Transducer

#### Postal address

IBEKO Power AB  
Box 1346  
181 25 Lidingö  
Sweden

#### Delivery address

IBEKO Power AB  
Stockholmsvägen 18  
181 50 Lidingö  
Sweden

#### Contact

phone: +46 8 731 76 99  
fax: +46 8 731 77 99  
sales@dv-power.com

**Example 1**

The linear transducer with its flexible articulated arm is installed on a static area of the circuit breakers housing, as shown below (Figure 2).

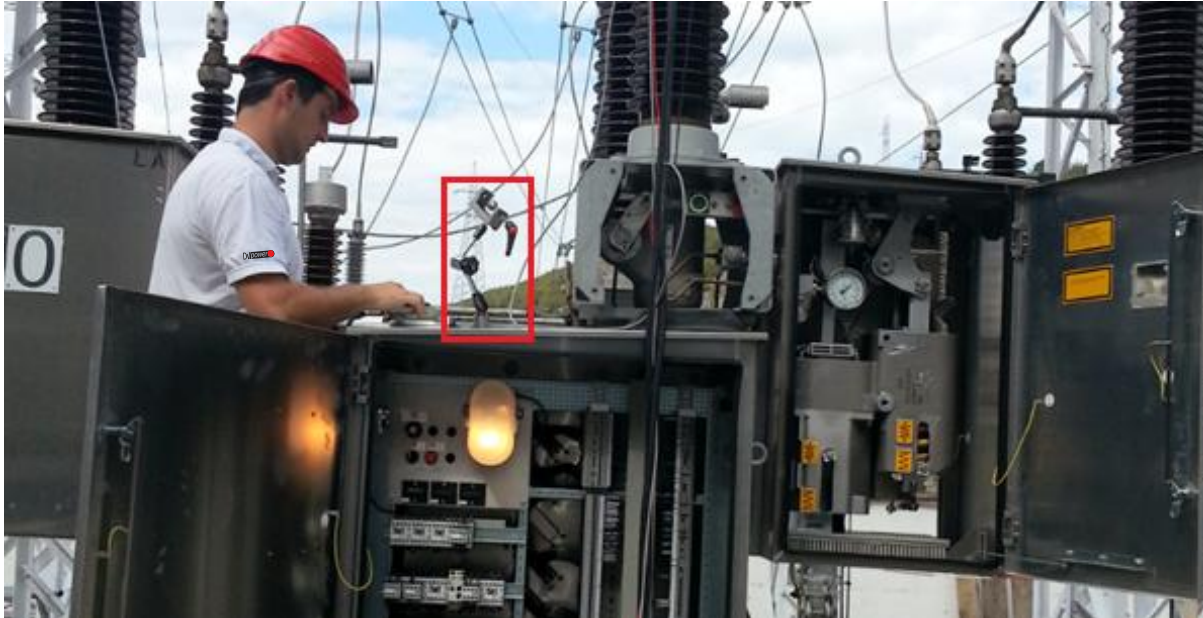


Figure 2. Preparation for installation of linear (analog) transducer

The transducer's movable rod is connected to the movable lever driving the horizontal movable linkage of the circuit breaker (*Siemens 123 kV CB, Type 3AP1F*) as shown in the Figures 3, 4, and 5.

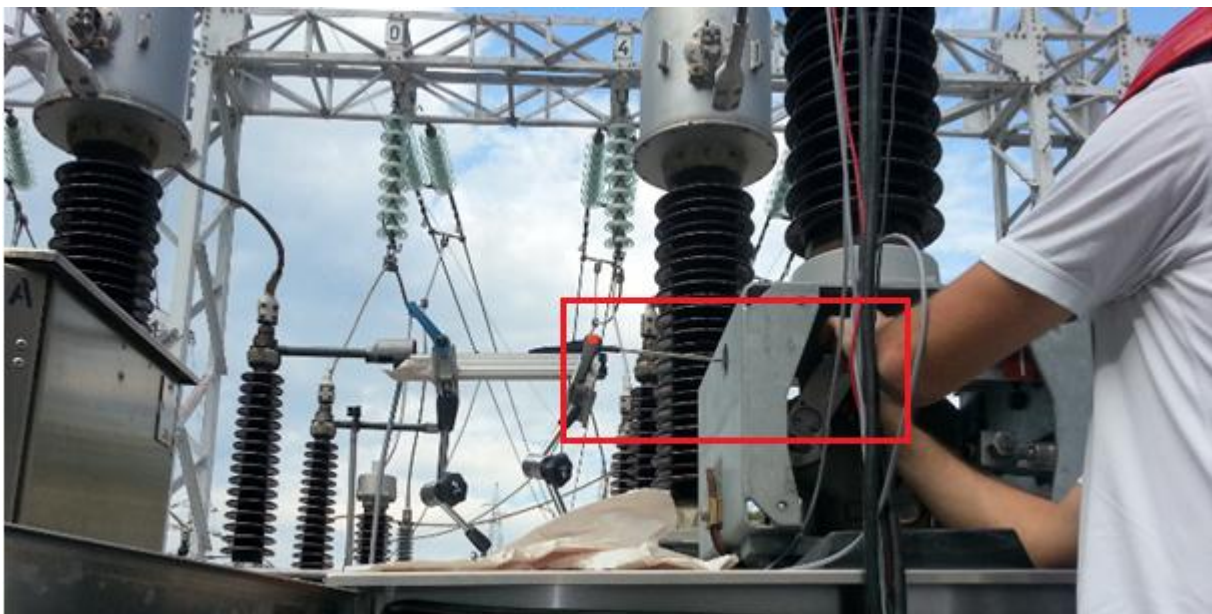


Figure 3. Installation of the linear transducer movable rod to CB

**Postal address**

IBEKO Power AB  
Box 1346  
181 25 Lidingö  
Sweden

**Delivery address**

IBEKO Power AB  
Stockholmsvägen 18  
181 50 Lidingö  
Sweden

**Contact**

phone: +46 8 731 76 99  
fax: +46 8 731 77 99  
sales@dv-power.com



Figure 4. Linear transducer movable rod installed on movable part of CB



Figure 5. Linear (analog) transducer installed on Siemens 123 kV CB, Type 3AP1F

**Postal address**

IBEKO Power AB  
Box 1346  
181 25 Lidingö  
Sweden

**Delivery address**

IBEKO Power AB  
Stockholmsvägen 18  
181 50 Lidingö  
Sweden

**Contact**

phone: +46 8 731 76 99  
fax: +46 8 731 77 99  
sales@dv-power.com

**Example 2**

The linear analog transducer installed on *Energoinvest SF6 123 kV, Type SFE 11/18-G* circuit breaker is shown in the Figure 6. Transducer moving rod is connected to the lever over which the dampers react to the mechanism motion.



Figure 6. LWG linear (analog) transducer installed on *Energoinvest SF6 123 kV CB, Type SFE 11/18-G*

This installation was made by using the combination of the transducer installation accessories including 2 x articulated arms and 2 x clamping bases.

**Postal address**

IBEKO Power AB  
Box 1346  
181 25 Lidingö  
Sweden

**Delivery address**

IBEKO Power AB  
Stockholmsvägen 18  
181 50 Lidingö  
Sweden

**Contact**

phone: +46 8 731 76 99  
fax: +46 8 731 77 99  
sales@dv-power.com

## Rotary transducer installation

DV Power recommends the following sets of rotary (digital) transducers with different cable length and with corresponding accessories:

Table 2. Rotary (digital) transducers

Article	Article number
Digital rotary transducer with 5 m connection cable	DRT-250-C605
Digital rotary transducer with 10 m connection cable	DRT-250-C610
Digital rotary transducer 5 m with accessories	DRT-SET-0005
Digital rotary transducer 10 m with accessories	DRT-SET-0010



Figure 7. Rotary Digital Transducer

### Example 3

The figure below illustrates how to install a rotary transducer to a screw of the rotating lever (marked with red rectangle). Rotary transducer shaft is connected to the rotating lever screw over flexible coupling and adapter (matching shaft).

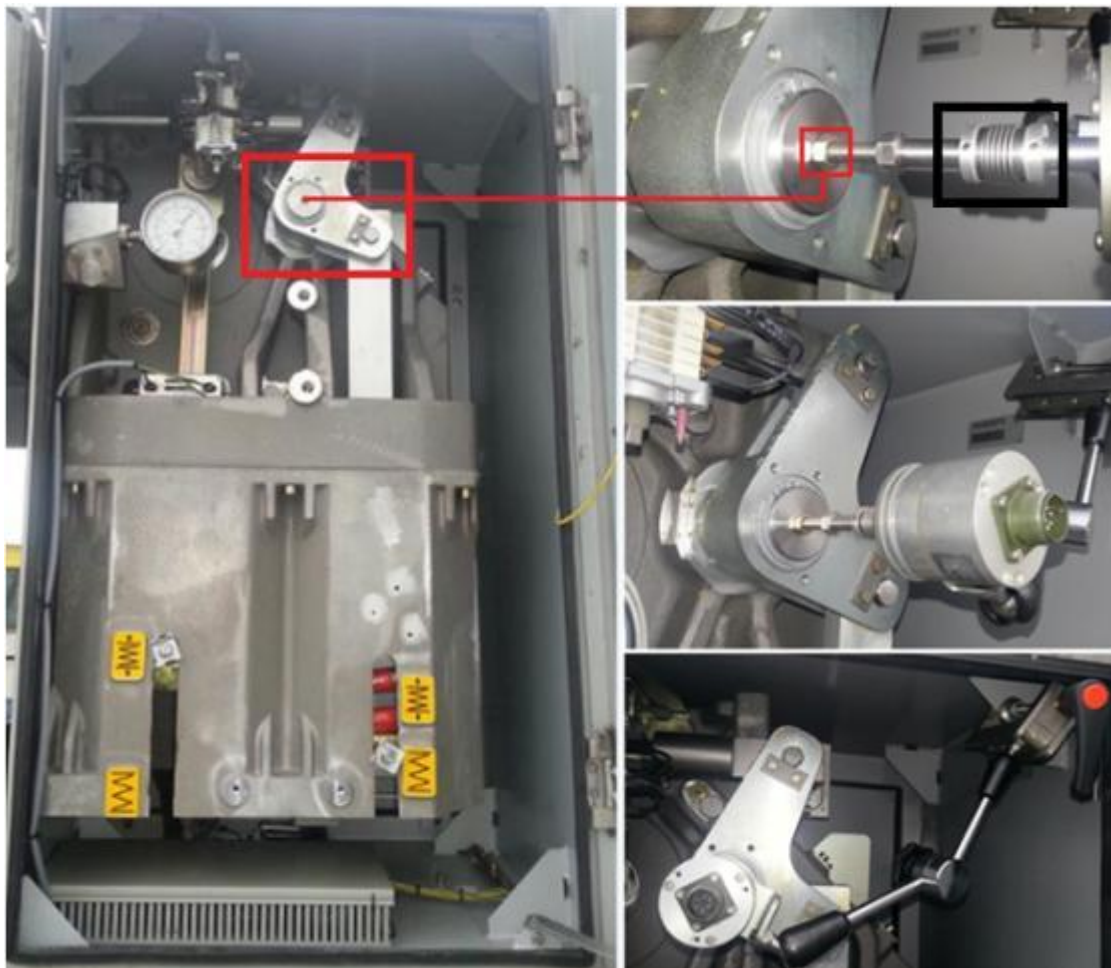


Figure 8. Installation of rotary (digital) transducer in Siemens 245 kV CB, Type 3AP1FI

#### Postal address

IBEKO Power AB  
Box 1346  
181 25 Lidingö  
Sweden

#### Delivery address

IBEKO Power AB  
Stockholmsvägen 18  
181 50 Lidingö  
Sweden

#### Contact

phone: +46 8 731 76 99  
fax: +46 8 731 77 99  
sales@dv-power.com

The flexible coupling (marked with black rectangle in the Figure 8) compensates for any misalignment between the adapter (matching shaft) and the rotary transducer.

**Example 4**

Installation of the rotary (digital) transducer in a dead tank circuit breaker via linear to rotary convertor is shown in the Figure 9. The mechanical adapter is installed on the main rotating shaft of the circuit breaker, providing conversion of rotary to linear motion. Movable rod is connected to this adapter and transmits linear to rotary motion via linear to rotary convertor. Finally rotary transducer is mounted on the linear to rotary convertor.



Figure 9. Rotary (digital) transducer installed on Dead Tank CB, ABB SF6 145 kV, Type 145 PM 63-20

Linear to rotary convertor is displayed in the Figure 10.

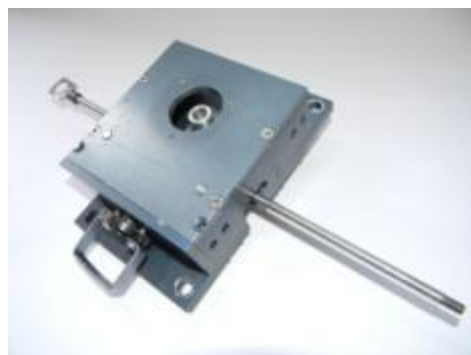


Figure 10. Linear to rotary convertor (article number LTR-CON-0000)

**Postal address**

IBEKO Power AB  
Box 1346  
181 25 Lidingö  
Sweden

**Delivery address**

IBEKO Power AB  
Stockholmsvägen 18  
181 50 Lidingö  
Sweden

**Contact**

phone: +46 8 731 76 99  
fax: +46 8 731 77 99  
sales@dv-power.com

**Example 5**

Installation of the rotary (digital) transducer in *Siemens* 245 kV CB (type 3AP1 FI) via universal adapter for rotary transducer mounting is shown in the Figure 11. The universal adapter is installed on the main rotating shaft of the circuit breaker since on the universal adapter there are holes which match with two screws on the lever. Finally, rotary transducer shaft is connected to the universal adapter screw over flexible coupling and adapter (matching shaft).



*Figure 11. Installation of rotary (digital) transducer in the SIEMENS 245 kV CB. type 3AP1 FI using universal adapter for rotary transducer mounting*

**Postal address**

IBEKO Power AB  
Box 1346  
181 25 Lidingö  
Sweden

**Delivery address**

IBEKO Power AB  
Stockholmsvägen 18  
181 50 Lidingö  
Sweden

**Contact**

phone: +46 8 731 76 99  
fax: +46 8 731 77 99  
sales@dv-power.com

## Accessories for rotary and linear transducer installations

All mounting kit components have a robust, heavy-duty design in order to guarantee immobilization and minimize vibrations of the transducers (Figure 12).

In case vibrations are still strong, an additional articulated arm can be mounted (Figure 12a ). This will further support the first transducer and additionally reduce vibrations.

During circuit breaker testing, a flexible kit is needed. It can be used on several circuit breaker types providing required accuracy.

Universal adapter for rotary transducer mounting (Figure 12b) provides mounting of the rotary transducer on the different types of circuit breakers.

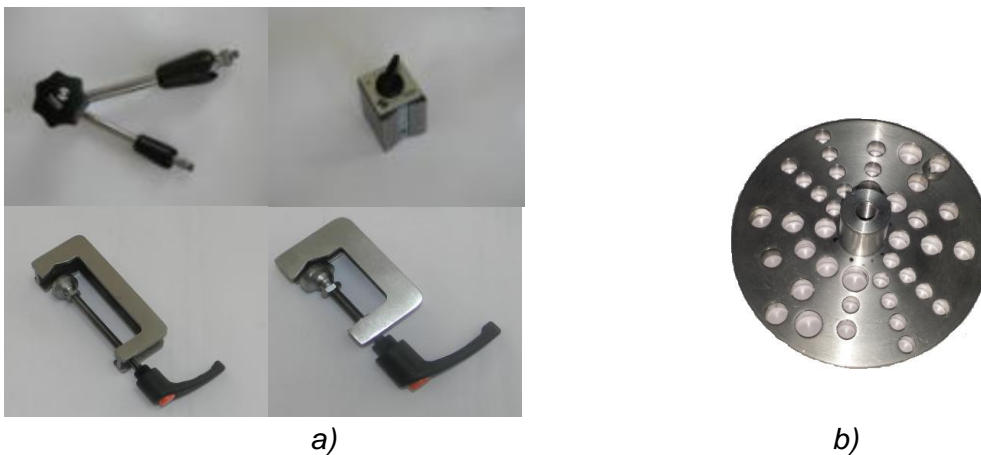


Figure 12. a) Articulated arm, Magnetic base, Big clamping base, Small clamping base, b) Universal adapter for rotary transducer mounting

DV power instruments support products from other manufacturers of test equipment. One of them is the Doble transducer adapter (shown in the Figure 13). It can be used to interface any Doble travel transducer with a DV Power circuit breaker analyzer and timer.



Figure 13. Doble transducer adapter (article number DTA-BOX-C002)

2015 DV Power, Sweden. All rights reserved.

### Postal address

IBEKO Power AB  
Box 1346  
181 25 Lidingö  
Sweden

### Delivery address

IBEKO Power AB  
Stockholmsvägen 18  
181 50 Lidingö  
Sweden

### Contact

phone: +46 8 731 76 99  
fax: +46 8 731 77 99  
sales@dv-power.com