BE6400

Blind Encoder for Mode S Transponders Series 6400

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Installation and Operation

Manual DV69804.03
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WARNING - USER RESPONSIBILITY

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Becker Avionics provide product or system options for further investigation by users having technical knowledge.

The user is responsible for making the final selection of the system and components. The user has to assure that all performance, endurance, maintenance, safety requirements of the application are met and warnings be obeyed.
For this the user has to include all aspects of the application to be compliant with the applicable industry standards and the requirements of the responsible aviation authority. The product documentations from Becker Avionics have to be obeyed.

To the extent that Becker Avionics provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

Term definition: User in the sense of user, installer, installation company.

Preface

Dear Customer,

Thank you for purchasing a Becker Avionics product. We are pleased that you have chosen our product and we are confident that it will meet your expectations.

For development and manufacturing of our product, the guidelines for highest quality and reliability have been borne in mind, supplemented by selection of high-quality material, responsible production and testing in accordance to the standards.

Our competent customer support department will respond on any technical question you may have.

Please do not hesitate to contact us at any time.

Blind Encoder *

Blind Encoder - BE6400

BE6400 with transponder

* design depends on variant.

* Some figures in this manual are for basic understanding and can be different to the design.

Table of Contents

1 General Description 9
1.1 Introduction 10
1.1.1 General 10
1.1.2 Manufacturer 10
1.1.3 Safety Information 10
1.1.4 Layout of Manual 10
1.1.5 Revisions of Manual 11
1.1.6 List of Abbreviations 11
1.2 Application 11
1.3 General Description 11
1.4 Technical Data 12
1.4.1 General Data 12
1.4.2 Dimensions & Weight 12
1.4.3 Altitude Data Output 12
1.4.4 Environmental Qualification 13
1.4.5 Software 14
1.4.6 Approvals 14
1.4.7 Continued Airworthiness 14
1.5 Order Code 14
1.5.1 Equipment 14
1.5.2 Accessories 14
2 Installation 15
2.1 General 15
2.2 Inspection before Installation 15
2.3 Mechanical Installation 16
2.4 Aircraft Wiring 17
2.5 Configuration Setting of the Transponder 18
2.6 Checking after Installation 18
2.6.1 General 18
2.6.2 Pre-flight Check 18
2.7 Dimensions 19
3 Operation 21
3.1 Operating Instructions 21
3.2 Flight Level Indication 21
3.3 Behavior in the Fault Case 21
3.4 Check the Blind Encoder 21
4 Index 24

List of Figures

Some figures in this manual are for basic understanding and can be different to the actual design.

Figure 1: Blind Encoder with Mode S Transponder 16
Figure 2: Dimensions BE6400, in mm 19

General Safety Definitions

⚠DANGER	Indicates a hazardous situation which, if not prevented, will result in death or serious injury.
⚠WARNING	Indicates a hazardous situation which, if not prevented, could result in death or serious injury.
⚠CAUTION	Indicates a hazardous situation which, if not prevented, could result in minor or moderate injury.
NOTICE	Is used to address practices not related to physical injury.
SAFETY INSTRUCTIONS	Safety instructions (or equivalent) signs indicate specific safety-related instructions or procedures.

Disposal

⚠CAUTION The packaging material is inflammable, by burning toxic fumes may develop.

This product contains materials that fall under the special disposal regulation. We recommend the disposal of such materials in accordance with the current environmental laws.

- Dispose circuit boards by a technical waste dump which is approved to take on e.g. electrolytic aluminium capacitors. Do under no circumstances dump the circuit boards with normal waste dump.

Warranty Conditions

⚠CAUTION The device(s) may be installed on an aircraft only by an approved aeronautical company (e.g. Part 145) which shall also examine the installation.

Any change made by the user excludes any liability on our part (excluding the work described in this manual).

- The device must not be opened.
- Do not make any modifications to the device, except for those described in the manual.
- Make connections to the inputs, outputs and interfaces only in the manner described in the manual.
- Install the devices related to the instructions.
  We cannot give any guarantee for other methods.

Conditions of Utilization

With this device you bought a product which was manufactured and tested before delivery with the utmost care.

Please take your time to read the instructions which you ought to follow closely during installation and operation.

Otherwise all claims under the warranty will become void and a decreased service life or even damages must be expected.

⚠CAUTION The user is responsible for protective covers and/or additional safety measures in order to prevent damages to persons and electric accidents.

Non-Warranty Clause

We checked the contents of this publication for compliance with the associated hard and software. We can, however, not exclude discrepancies and do therefore not accept any liability for the exact compliance. The information in this publication is regularly checked, necessary corrections will be part of the subsequent publications.

List of Effective Pages and Changes

Only technical relevant modifications are described in this table.

Document:	**DV69804.03 issue 03**	**Article Number 0594.547-071**
Cover Page	11/2019	
Introduction	11/2019	
Chapter 1 – 4	11/2019	

Issue	**Page No.:**	**Section / Chapter**	**Description**
03	1-24	all	Updated: Editorial adjustments
	--	1.4.6	Updated: Approvals
	--	1.4.7	Added: Continued Airworthiness
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	--		
	--		
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1 General Description

In this chapter you can read about:

1.1 Introduction 10
1.1.1 General 10
1.1.2 Manufacturer 10
1.1.3 Safety Information 10
1.1.4 Layout of Manual 10
1.1.5 Revisions of Manual 11
1.1.6 List of Abbreviations 11
1.2 Application 11
1.3 General Description 11
1.4 Technical Data 12
1.4.1 General Data 12
1.4.2 Dimensions & Weight 12
1.4.3 Altitude Data Output 12
1.4.4 Environmental Qualification 13
1.4.5 Software 14
1.4.6 Approvals 14
1.4.7 Continued Airworthiness 14
1.5 Order Code 14
1.5.1 Equipment 14
1.5.2 Accessories 14

This manual describes the Becker Avionics Blind Encoder BE6400-01-(XX). The type plate on your device shows the part number for identification purposes.

Before starting operation of the device(s) please read this manual carefully, with particular attention to the description referring to your device(s).

1.1 Introduction

1.1.1 General

The Blind Encoder BE6400-01-(XX) for Becker Avionics Mode S transponder Class 2, Level 2es in accordance with ETSO-C88a and Class 2B in accordance with TSO-C88a is described in this manual.

1.1.2 Manufacturer

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CERTIFIED QUALITY SYSTEM

The Becker Avionics quality management system is certified according to:
DIN EN ISO 9100:2018 CERT Reg. - Nr. 12 210 20985 TMS

LICENSES AND APPROVALS

DE.21G.0075 Approval as manufacturer to EASA PART 21
DE.145.0166 Approval as maintenance organization to EASA PART 145

1.1.3 Safety Information

The installation of the Blind Encoder into an aircraft may be carried out only by an authorized installation company.

1.1.4 Layout of Manual

The manuals “Maintenance and Repair” **(M&R)**, “Installation and Operation **(I&O)** and "Operation Instructions" **(OI)** contain the sections:

Section	**DV69804.04 M&R**	**DV69804.03 I&O**
General	X	X
Installation	X	X
Operation	X	X
Theory of Operation	X	N/A
Maintenance and Repair	X	N/A
Illustrated Parts List	X	N/A
Modification and Changes	X	N/A
Circuit Diagrams	X	N/A
Certifications	X	N/A
Attachments	X	N/A

1.1.5 Revisions of Manual

All changes to the manual are recorded see "List of Effective Pages and Changes" page 7.

1.1.6 List of Abbreviations

ADLP	Avionics Data Link Processor
ALT	Altitude or transponder ALT mode
ALTS-/+	Data interface for serial encoding altimeter
AN	Article Number
ATC	Air Traffic Control
DV	Manual identification number
EASA	European Aviation Safety Agency
EIA	Electronic Industry Association
ETSO	European Technical Standard Order
EUROCAE	European Organization for Civil Aviation Equipment
FAA	Federal Aviation Administration
FL	Flight Level
Ft	Feet
GND	Ground
ID	Identifier
NSCM	Nato Supply Code of Manufacturers
RF	Radio Frequency
RTCA	Radio Technical Commission for Aeronautics
SI	Surveillance Identifier
SUPP	Equipment supply voltage DC
TSO	Technical Standards Order
XPDR	Transponder

1.2 Application

Together with the Becker Mode S transponder BXP6401 or BXP6402 the Blind Encoder BE6400 forms the aircraft part of the air traffic control system.

1.3 General Description

- The blind encoder is designed for use with BXP6401 single block Mode S transponder and with the BXP6402 remote unit Mode S transponder.
- The equipment is intended to be connected to the J8 unit connector of the transponders BXP6401/BXP6402 and can be used only in installations that do not require connection of other equipment utilizing ADLP interface of the transponder.
- The equipment provides a static port for connection to the aircraft static port.
- The blind encoder is supplied via the transponder, no separate power connection is required.
- The equipment is intended only for direct connection to the transponder, without any interwiring.

1.4 Technical Data

1.4.1 General Data

BE6400	Specifications
Power supply	supplied through pin 4 of XPDR (BXP640X unit connector J8)
Equipment input voltage	3.2...6.0 VDC
Current consumption max.	12 mA
Start-time of reporting altitude	≤ 1.5 s
Measurement range	-1000...20000 ft
Altitude increments	100 ft
Pressure data interface	RS-422 serial, compatible to BXP640X and ALT mode UPS/AT
Data transfer:	
Baud rate	1200
No of data bits	8
No of stop bits	1
Parity	None
Operating altitude	up to 20000 ft
Operating temperature range	- 15° C to + 55° C
Storage temperature range	- 40° C to + 85° C
Environmental conditions	in accordance with EUROCAE/RTCA ED-14D/DO-160D
Insulation resistance between case and electrical circuits	> 5 MΩ

1.4.2 Dimensions & Weight

BE6400	Specifications
Dimensions LxWxH	62.9 x 63 x 14.8 mm (L x W x H) (2.476 x 2.480 x 0.583 inch)
Weight	approx. 100 g (0.225 lb)

1.4.3 Altitude Data Output

The equipment provides an output for transmission of altitude and status reports. The output is differential and provide voltage levels compatible with EIA-422 standard:

Logic state	Non- inverting output	Inverting output
0	max. 0.5 V	min. 2.2 V
1	min. 2.2 V	max. 0.5 V

1.4.4 Environmental Qualification

EUROCAE/RTCA ED-14D/DO-160D

Environmental Condition	Section	Cat.	Remarks
Temperature and Altitude	4	A4	
Low Ground Survival Temperature	4.5.1	A4	-40 deg C
Low Operating Temperature	4.5.1	A4	-15 deg C
High Ground Survival Temperature	4.5.2	A4	+85 deg C
High Operating Temperature	4.5.2	A4	+55 deg C
In-flight Loss of Cooling	4.5.4	Z	No forced cooling required – No test required
Altitude	4.6.1	A4	20 000 ft
Decompression	4.6.2	A4	20 000 ft
Overpressure	4.6.3	A4	-15 000 ft
Temperature Variation	5	B	5 deg C/min
Humidity	6	A	Standard humidity environment
Shock and Crash Safety	7	B	Fixed-wing aircrafts and helicopters
Vibration	8	S U	Cat. S, vibrations test curve M Cat. U, vibrations test curve G
Explosion Proofness	9	X	No test required
Waterproofness	10	X	No test required
Fluids Susceptibility	11	X	No test required
Sand and Dust	12	X	No test required
Fungus Resistance	13	X	No test required
Salt Spray	14	X	No test required
Magnetic Effect	15	Z	<1 deg deflection at 0.3 m
Power Input	16	B	
Voltage Spike	17	A	
Audio Freq. Conducted Susceptibility	18	X	
Induced Signal Susceptibility	19	A	Interference-free operation desirable
Radio Frequency Susceptibility	20	WW	Interim High Intensity Radiated Fields
Emission of Radio Frequency Energy	21	B	Equipment where interference should be controlled to a tolerable level
Lightning Induced Transients Susceptibility	22	A3 E3	Pin test waveform A, level 3 Cable bundle test waveform E, level 3
Lightning Direct Effects	23	X	No test required
Icing	24	X	No test required
Electrostatic Discharge (ESD)	25	A	Equipment operated in an aerospace environment

Notice: With exception of the overpressure test (Section 4.6.3 of EUROCAE/RTCA ED-14D/DO-160D) all qualification tests were applied to the combination Becker BXP6401 and Becker BE6400.

1.4.5 Software

The Blind Encoder BE6400-01-(XX) is controlled by a microcontroller. The software criticality is determined to be Level C in accordance with EUROCAE/RTCA document ED12B/DO-178B.

1.4.6 Approvals

EASA	ETSO Authorization EASA.21O.658

1.4.7 Continued Airworthiness

Obey the legal regulations of the state of registration.

We recommend an annual inspection by the customer or the manufacturer.

1.5 Order Code

1.5.1 Equipment

Blind Encoder BE6400-01-(01)	Article-No. 0592.137-915

1.5.2 Accessories

Air pressure tube, e.g. Polyurethane tube, blue from LEGRIS (outer diameter 6 mm, inner diameter 4 mm).

Manual "Installation and Operation"	Article-No. 0594.547-071
Manual "Maintenance and Repair"	Article-No. 0547.571-071

2 Installation

In this chapter you can read about:

2.1 General 15
2.2 Inspection before Installation 15
2.2.1 Mechanical Installation 16
2.3 Aircraft Wiring 17
2.4 Configuration Setting of the Transponder 18
2.5 Checking after Installation 18
2.5.1 General 18
2.5.2 Pre-flight Check 18
2.6 Dimensions 19

2.1 General

Installation of the Blind Encoder BE6400-01-(XX) is depending on the aircraft type and its classification as well as requirements. Therefore, only general information can be provided in this section.

2.2 Inspection before Installation

Before the blind encoder is installed on an aircraft, a visual inspection for possible transport damages shall be done.

Please look out for the following defects:

- Dirt, dents, scratches, corrosion, broken fastening elements on connector housing and housing parts.
- Dirt and scratches on nameplate and inscriptions.
- Dirt, bent or broken pins, cracked insert of equipment connector.
- Missing screws.

2.3 Mechanical Installation

The blind encoder is designed for installation in an aircraft together with the Becker Mode S transponder BXP6401or BXP6402.
The equipment is capable of being mounted to the J8 unit connector of the transponder. To the mechanical stabilization the blind encoder must be fastened with a device at the housing of the transponder (see "Figure 1: Blind Encoder with Mode S Transponder" page 16).
For outline dimensions of the blind encoder see "Figure 2: Dimensions BE6400, in mm" page 19.
The sensor of the blind encoder must be connected with the outer air over a flexible air pressure tube (see "Accessories" page 14). The inner diameter of the air pressure tube must be 4 mm. The sensor therefore gets the outer air pressure of the respective aircraft for the altitude measuring.
Note: The protection cover must be removed before connect the air pressure tube.

Figure 1: Blind Encoder with Mode S Transponder

2.4 Aircraft Wiring

Pin connections of the unit connector P8 (for BXP6401 and BXP6402).

Connector type: D-SUB 25-pole male.

P8 Pin	Name	Function
1	-	-
2	-	-
3	GND	Signal and supply return
4	SUPP	Equipment supply
5	-	-
6	-	-
7	-	-
8	-	-
9	-	-
10	-	-
11	-	-
12	ALTS-	Altimeter receiver input inverting
13	ALTS+	Altimeter receiver input-non-inverting
14	-	-
15	-	-
16	-	-
17	-	-
18	-	-
19	-	-
20	-	-
21	GND	Signal and supply return
22	-	-
23	-	-
24	-	-
25	-	-

2.5 Configuration Setting of the Transponder

After the installation of the equipment, the configuration setting of the transponder must be adapted in the following way (supposing that programmed Address Module and antenna are connected):

- (1) Switch the transponder to "SBY" and press the "SEL" button.
- (2) Turn the rotary knob until "INS" appears in the lower left corner of the display.
- (3) Press the rotary button. "PASSWORD" appears in the display.
- (4) Enter "6435" by turning the rotary knob and press it to go to the next digit.
- (5) Press the "STO" button. The display shows "ALTM SELECT".
- (6) Check if "UPS AT" is marked. If yes, go to (9).
- (7) Turn the rotary knob until "UPS AT" is highlighted.
- (8) Press the “STO” button to select "UPS AT".
- (9) Press the rotary button until "SPECIALS" appears in the display.
- (10) Check if "ALTM HIGH RESOL" is marked. If yes, go to (13).
- (11) Turn the rotary button to select "ALTM HIGH RESOL".
- (12) Press the "STO" button to set high resolution.
- (13) Press the rotary button until "ERROR LATCHES" appears in the display.
- (14) Turn the rotary button to select "CLEAR LATCHES".
- (15) Press the "STO" button to clear the error latches.
- (16) Press the "SEL" button to leave the menu.
- Configuration is complete.

2.6 Checking after Installation

2.6.1 General

After the installation, check the blind encoder in conjunction with the corresponding transponder to ensure satisfactory operation of the equipment.

2.6.2 Pre-flight Check

Switch the Mode S transponder to "ALT" and check the correct flight level is displayed.

2.7 Dimensions

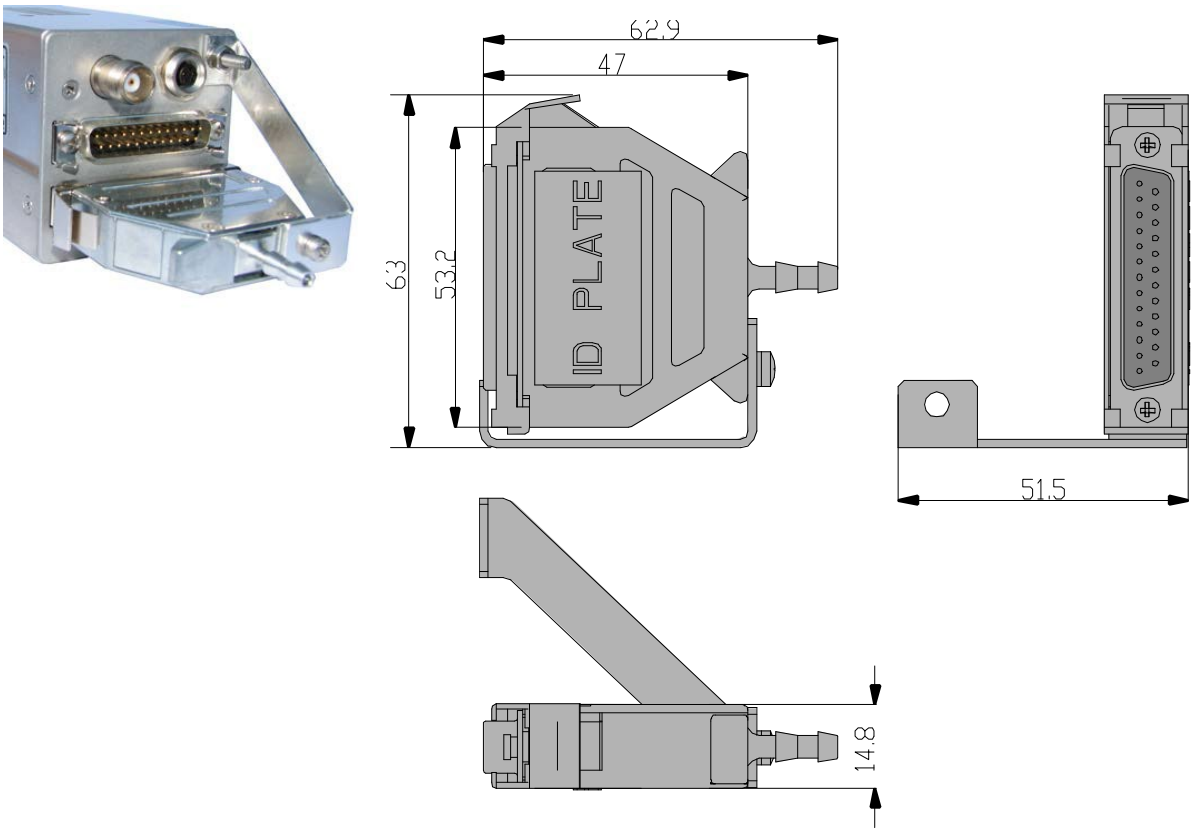

Figure 2: Dimensions BE6400, in mm

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3 Operation

In this chapter you can read about:

3.1 Operating Instructions 21
3.2 Flight Level Indication 21
3.3 Behavior in the Fault Case 21
3.4 Check the Blind Encoder 21

3.1 Operating Instructions

- The operation of the Blind Encoder is controlled by the Becker Mode S transponder BXP6401 or BXP6402.
- Place the Mode S transponder in the altitude reporting mode to transmit the altitude data.
- The start time of altitude reporting is ≤ 1.5 seconds.

3.2 Flight Level Indication

The altitude flight level is indicated in the bottom row of the Mode S transponder display (altitude = FL x 100 in ft).

Faulty measurements of the blind encoder are displayed in the bottom row by "---" indication instead of altitude reports.

3.3 Behavior in the Fault Case

In case of a failure, the altitude indication has to be turned off, i.e. switch the Mode S transponder to ON using the mode switch.

The transponder runs in Mode A without transmitting altitude information.

3.4 Check the Blind Encoder

The blind encoder has to be checked for function and data retention in the context of the annual check of the aircraft. If at these deviations are stated, then the blind encoder must be calibrated or overhauled in the manufacturer factory.

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4 Index

Approved Organization 2
Conditions of Utilization 6
Disposal 6
General Safety Definitions 5
List of Effective Pages and Changes 7
List of Figures 4
Non-Warranty Clause 6
Preface 3
Table of Contents 4
WARNING - USER RESPONSIBILITY 2
Warranty Conditions 6

We reserve the right to make technical changes.
The data match to the current status at the time of printing.

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