



**Intrinsically safe limit switch box
for harsh applications
for pneumatic actuators
ACTAIR NG and DYNACTAIR NG
for hydraulic actuators HQ
and manual actuators MR**

II 1 G and 2D

Ex ia Ex tb


Position monitoring

Applications

- Harsh applications such as marine or heavy industry.
- Explosive atmospheres.

General information

- AMTROBOX R EEx ia (R1188) is a robust open/close detection box by switches or proximity sensors.
- Its protection modes are: Intrinsically safety "ia" and protection by enclosure "tb" in accordance with EN 60079-0, EN 60079-11 and EN 60079-31 standards. EC type examination certificate: LCIE 04 ATEX 6075X. The representative gas of explosion risk is hydrogen, the maximum temperature of the box is 80 °C.
- No bracket is necessary, overall dimensions are reduced.
- It can be mounted directly on actuators compatible with VDI/VDE 3845 interface.
- The signaling position is realized by a visual pointer two-colour big size.
- It is in accordance with ATEX 2014/34/EU directive regarding to explosive atmosphere and marking:

CE 0081 

II 1 G Ex ia IIC T6 or T5 or T4 Ga (1)

II 1 G Ex ia IIB T6 or T5 Ga (1)

II 2 G Ex ia IIC T6 or T5 Gb (1)

II 2 D Ex tb IIIC T80 °C Db

(1): marking depending on the internal equipment

Protection

- IP 68 rating
- Corrosion resistant: protection by cathodolysis and paint coating.

Temperature range

- From -25 °C to +80 °C (the maximal ambient temperature may vary depending on the internal equipment)

Materials

- Base : Ductile iron.
- Cover : Ductile iron.

Standard variantes

- Valve position feed-back by potentiometer or 4-20 mA transmitter.
- Visual indication of valve position by flag.
- Submersible version.
- Flat pointer

This leaflet is also to be used as a start-up guide ref. 42 057 231

Contents

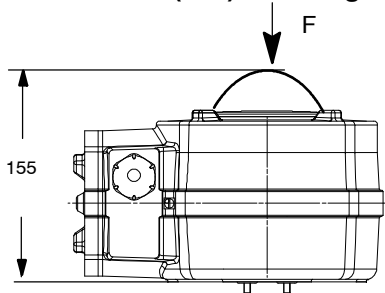
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Technical data

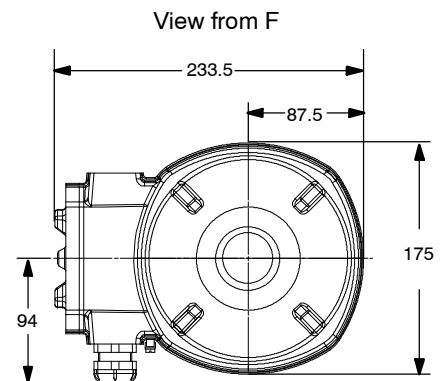
Environment	
- Protection level	IP 68 (30 m, 72 hours)
- Resistance to vibrations	According to "Test Programm Lloyd's Register - Vibration test 1" and IEC 60068-2-6 Test Fc standard. Frequency: 5 to 100 Hz. Displacement: ± 1 mm. Acceleration: ± 0,7 g.
- Working temperature	From - 25° C up to + 80° C (from - 13° F up to + 176° F) (the maximal ambient temperature may vary depending on the internal equipment)
- Electromagnetic compatibility: Standards	EN 61000-6-2; EN 61000-6-4
- Intrinsically safe in accordance with EN 60079-0, EN 60079-11 and EN 60079-31 standards	

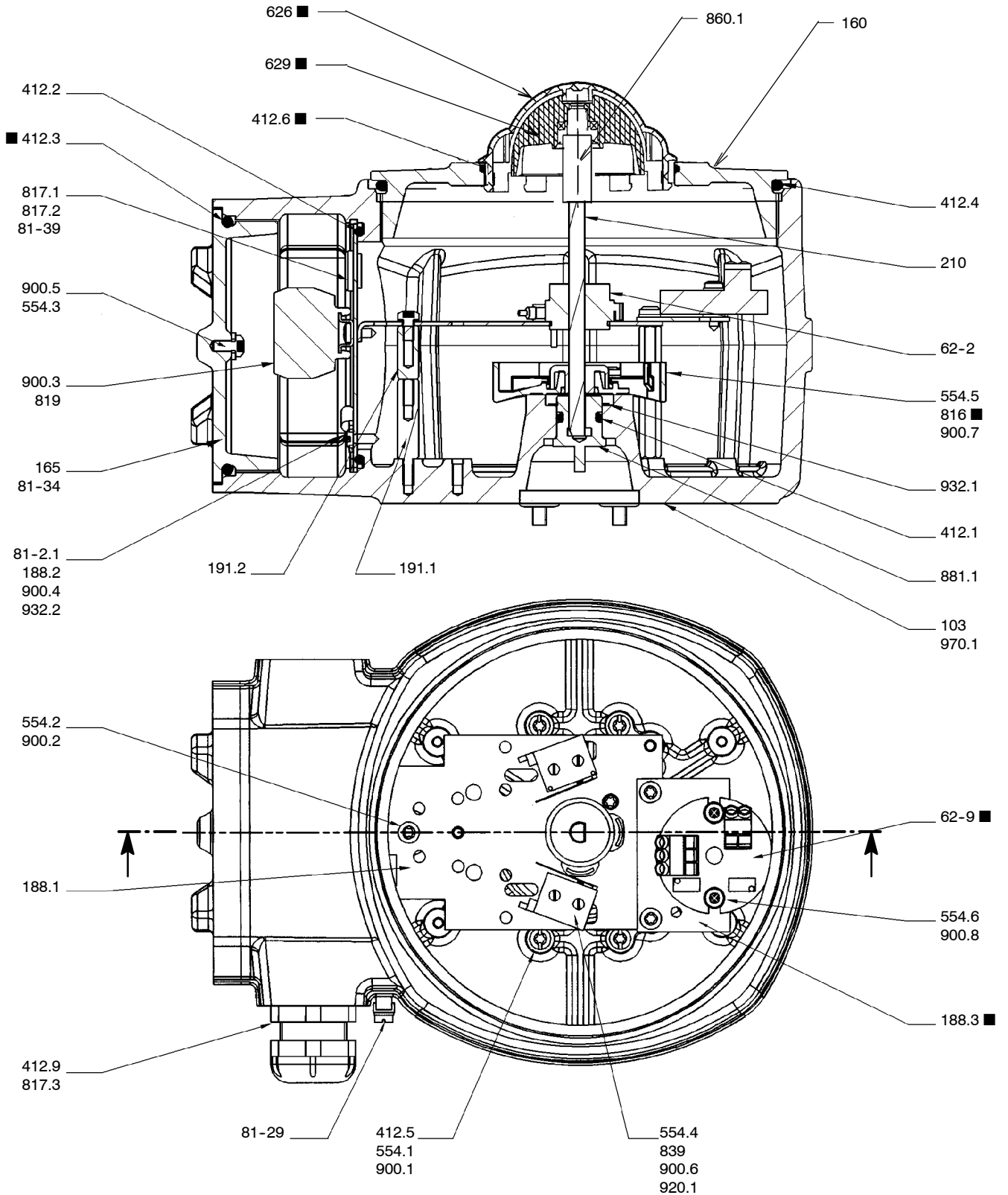
Housing	
- Material:	JL 1040 cast iron
- Coating:	Cataphoresis (25 µm) + black paint (125 µm)
- Signalisation:	By pointer or flag
- Electrical connection:	By packing-gland (metallic or plastic) M25 x 1.5 or M20 x 1.5 for cable dia. 6 to 18 mm

Overall dimensions (mm) and weight (kg)



Weight: 8.6 kg





Version shown :
position detection by microswitches with angle sensor and 4-20 mA transmitter

■ Parts included in the spare parts kit

Item	Designation	Materials
103	Housing	JL 1040 cast iron
160	Cover	JL 1040 cast iron
165	Electric compartment cover	JL 1040 cast iron
188.1	Fixing plate	Steel
188.2	Fixing plate	Stainless steel
188.3 ■	Fixing plate	Steel
191.1	Support of printed circuit board	Nickeled brass
191.2	Support of printed circuit board	Nickeled brass
210	Operating shaft	Stainless steel
412.1	O-Ring	Nitrile
412.2	O-Ring	Nitrile
412.3 ■	O-Ring	Nitrile
412.4	O-Ring	Nitrile
412.5	O-Ring	Nitrile
412.6 ■	O-Ring	Viton
412.9	O-Ring	Nitrile
554.1	Plain washer	Stainless steel
554.2	Plain washer	Stainless steel
554.3	Waved washer	Stainless steel
554.4	Plain washer	Stainless steel
554.5	Serrated lock washer	Steel
554.6	Plain washer	Stainless steel
62-2	Cam sub-assembly	Acetal
62-9 ■	4-20 mA transmitter	-----
626 ■	Sight glass	Transparent polycarbonate
629 ■	Pointer	Polyamide
81-2.1	Ground wire sub-assembly	Copper + PVC
81-29	Ground terminal	-----
81-34	Coupling wiring diagram	-----
81-39	Collar	-----
816 ■	Angle sensor	Acetal
817.1	Grommet	-----
817.2	Grommet	-----
817.3	Packing-gland	-----
819	Terminal block	-----
839	Microswitch	-----
860.1	Adjustment adaptation sleeve	Stainless steel
881.1	Hub	Brass
900.1	Cheese-head screw	Stainless steel
900.2	Cheese-head screw	Stainless steel
900.3	Self-tapping screw	Stainless steel
900.5	Self-tapping screw	Stainless steel
900.6	Cheese-head screw	Stainless steel
900.7	Cheese-head screw	Steel
900.8	Self-tapping screw	Stainless steel
900.9	Cheese-head screw	Stainless steel
920.1	Heganonal nut	Steel
932.1	Self locking	Steel
932.2	Circlip	Stainless steel
970.1	Identity plate	Polyester

■ Parts included in the spare parts kit

Position detection

The intrinsically safe microswitches and proximity detectors in AMTROBOX R EEx ia comply with EN 60079-0 and EN 60079-11 standards relating to components installed in explosive environment.

They must be connected individually to an approved safety barrier. Situated in a safe area, these barriers allow the power supply of the microswitches or detectors installed in hazardous area.

By microswitches

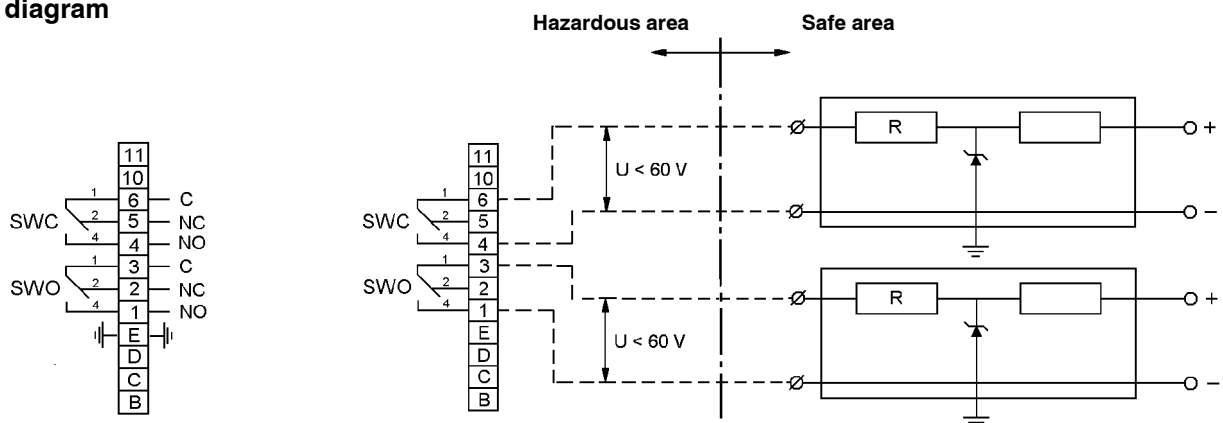
Technical characteristics

• Manufacture:	Crouzet
• Type:	83 186 069 lever 170A R=24
• Conformity certificate:	Material according to EN 50020 §5 standard - Common material
• Electrical output:	by 3-wire cable, section 0.5 mm ²
• Protection level:	IP 68
• Wiring:	The two microswitches are workshop-connected to the main terminal block by means of spring connectors, capacity 2.5 mm ² . Refer to wiring diagram below.
• Max. voltage:	60 VDC
• Capacitive reactance:	4.6 pF
• Inductance:	0 mH
• Mechanical and electrical life:	2 . 10 ⁶ cycles
• Resistance to impacts:	5 g according to CEI 68-2-27
• Resistance to vibrations:	According to "Test Programm Lloyd's Register - Vibration test 1" and IEC 60068-2-6 Test Fc standard. Frequency: 5 to 100 Hz. Displacement: ± 1 mm. Acceleration: ± 0,7 g
• Function:	Change-over

Special conditions for safe use

• Working ambient temperature :	≤ +80 °C
• Max. voltage U ₀ :	≤ 26,5 VDC
• Max. current I ₀ :	≤ 127 mA
• Marking AMTROBOX R	II 1 G Ex ia IIC T6 Ga II 2 D Ex tb IIIC T80 °C Db

Wiring diagram

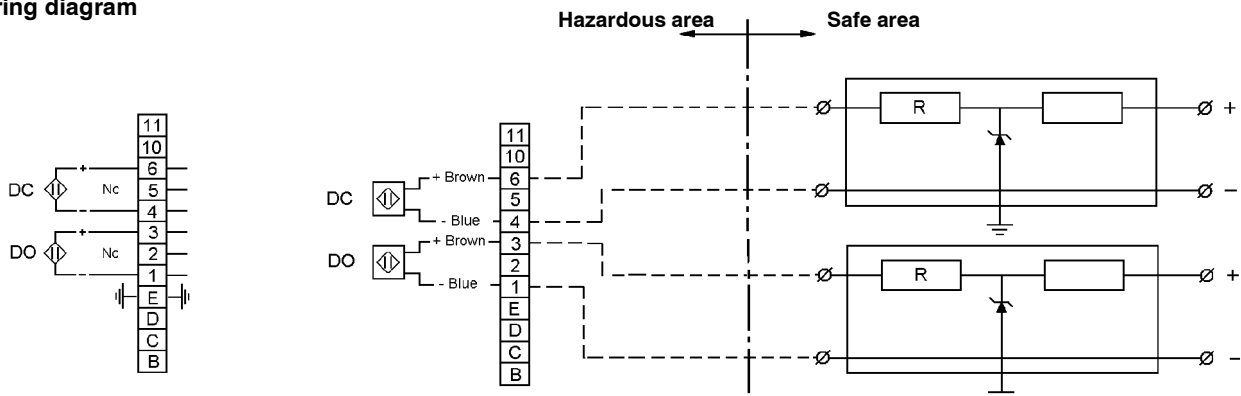


By proximity detectors
Technical characteristics

• Manufacturer:	IFM Effector	Pepperl & Fuchs
• Type:	NS 5002	NJ2-V3-N
• Conformity certificate:	PTB 01 ATEX 2191	PTB 00 ATEX 2032 X
• Nominal voltage:	8.2 Vdc	8 Vdc
• Voltage:	5 to 25 Vdc	-----
• Off state ondulation:	< 5%	-----
• Cable max. resistance:	50 Ω	-----
• Output activation:	< 1 mA	< 1 mA
• Output non activation:	< 2.2 mA	< 3 mA
• Self capacity:	< 80 nF	< 40 nF
• Self inductance:	< 110 μH	< 50 μH
• Switching frequency:	800 Hz	1000 Hz
• Resistance to impacts:	< 30g on 10 ms	-----
• Resistance to vibrations:	< 10 to 55 Hz. a = 1 mm	-----
• Protection level:	IP 68	IP 68
• Rated operating distance:	2 mm	1,62 mm
• Output type:	NF	NF
• Connection:	Cable PVC: 2 x 0.14 mm ²	

Special conditions for safe use

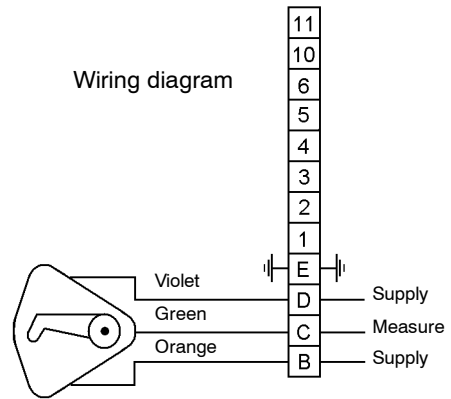
	IFM Effector NS-5002	Pepperl & Fuchs NJ2-V3-N
• Working ambient temperature :	See below	See below
• Max. voltage U ₀ :	≤ 15 VDC	≤ 16 VDC
• Max. current I ₀ :	≤ 50 mA	≤ 25 mA
• Max. Consumption P ₀ :	≤ 120 mW	≤ 34 mW
• Marking AMTROBOX R:	II 1 G Ex ia IIB T6 Ga (Ambient temperature ≤ +70 °C) II 2 D Ex tb IIIC T80 °C Db or II 1 G Ex ia IIB T5 Ga (Ambient temperature ≤ +80 °C) II 2 D Ex tb IIIC T80 °C Db or II 2 G Ex ia IIC T6 Gb (Ambient temperature ≤ +70 °C) II 2 D Ex tb IIIC T80 °C Db or II 2 G Ex ia IIC T5 Gb (Ambient temperature ≤ +80 °C) II 2 D Ex tb IIIC T80 °C Db	II 1 G Ex ia IIC T6 Ga (Ambient temperature ≤ +56 °C) II 2 D Ex tb IIIC T80 °C Db or II 1 G Ex ia IIC T5 Ga (Ambient temperature ≤ +68 °C) II 2 D Ex tb IIIC T80 °C Db or II 1 G Ex ia IIC T4 Ga (Ambient temperature ≤ +80 °C) II 2 D Ex tb IIIC T80 °C Db

Wiring diagram


Options

Feed-back position 0° to 90° by resistive angle sensor

AMTROBOX R EEx ia can be equipped with feed-back position sensor. So, the valve position is transmitted during its whole travelling angle by means of a variable resistance between 0 Ω and 4,7kΩ.



Technical characteristics of angle sensor

	Min.	Nominal	Max.	Units
Mechanical travel	80	90	105	Degrees
Electrical span	3.58	4.03	4.7	kΩ
Maximal current			1	mA
Mechanical and electrical life			> 5.10 ⁶	Travel O/C

In instrumentation technology, the use of a potentiometer to transmit a signal under voltage exposes the user to electromagnetic pollution, mainly for high distance transmissions or in very polluted environment. The use of a 4-20 mA current loop is always preferable due to its better electromagnetic strength (see below).

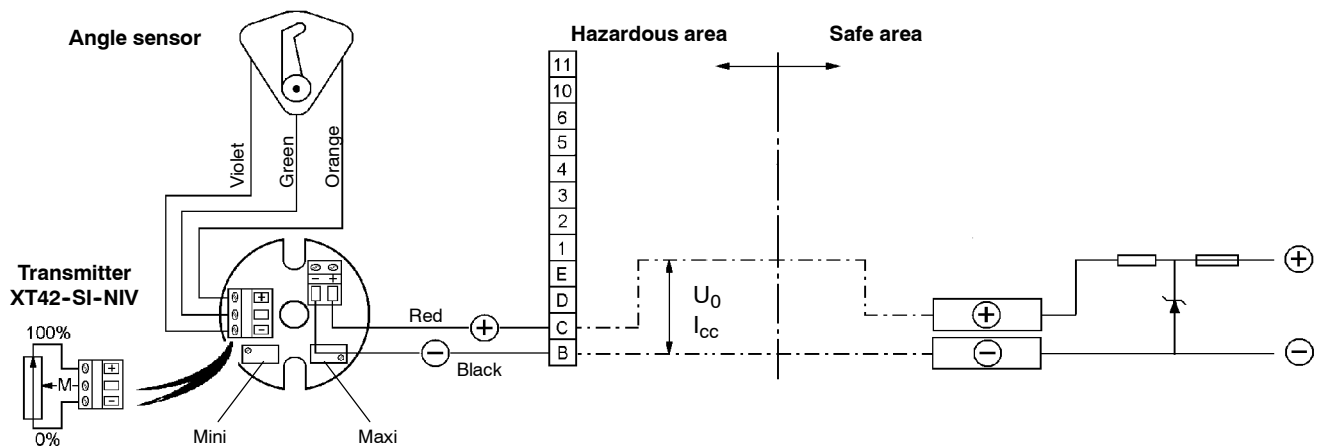
Feed-back position 0° to 90° by 4-20 mA transmitter

AMTROBOX R EEx ia can be equipped with feed-back position transmitter XT 42 SI-NV (AP 3).

So, the valve position is transmitted during its whole travelling angle by means of current loop variation from 4 to 20 mA.

Wiring diagram

The wiring of the angle sensor and transmitter assembly is carried out in workshop, the connection to the current loop is achieved through the terminal C for ⊕ and on the terminal B for ⊖.



Special conditions for safe use

CAUTION !

The intrinsically safe parameters concerning the elements could be connected on the terminals 10 and 11, must not exceed the values below:

U _i	I _i	P _i	C _i	L _i
30 V	101 mW	758 mW	0 mH	0
29.3 V	107 mW	784 mW	0 mH	0
28.4 V	116 mW	824 mW	0 mH	0

Marking AMTROBOX R with position feedback:

II 1 G Ex ia IIB T6 Ga
 (Ambient temperature ≤ +70 °C)
 II 2 D Ex tb IIIC T80 °C Db
 or
 II 1 G Ex ia IIB T5 Ga
 (Ambient temperature ≤ +80 °C)
 II 2 D Ex tb IIIC T80 °C Db

4-20 mA transmitter adjustment

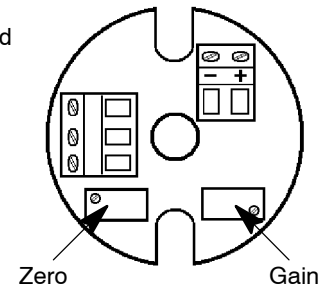
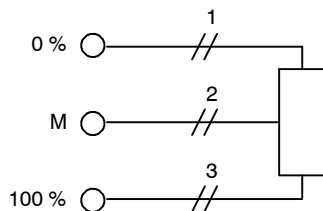
When the AMTROBOX R EEx ia box is delivered with its actuator, the transmitter is preadjusted in workshop.

It is not necessary to re-adjust it before valve mounting on site.

Nevertheless, if you wish to re-adjust it after a maintenance operation, proceed as follows:

- Remove the top cover of AMTROBOX R EEx ia by unscrewing it with a wrench.
- Two adjustments are available for the zero adjustment (4 mA) and the gain (20 mA).
- Replace the top cover of the box by screwing it with a wrench.

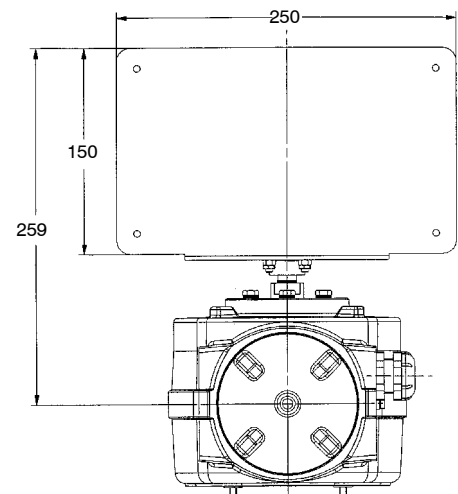
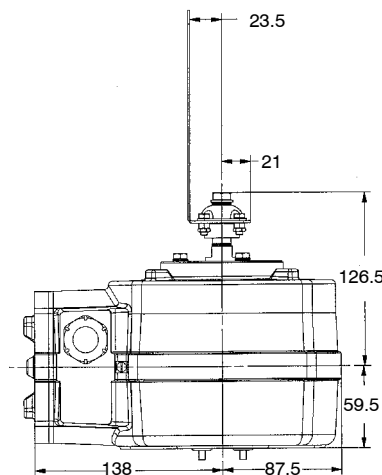
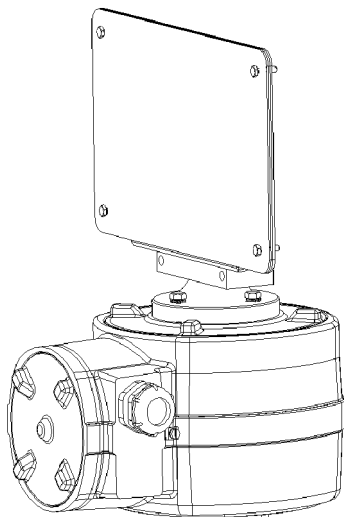
Zero adjustment (4 mA) : ± 5 %
 Gain adjustment (20 mA) : ± 10 %
 Accuracy : ± 1 % of full scale


Detection of faulty box or angle sensor connections.


Defect	Transmitter response
wire 1 open	I output ≈ 20 mA
wire 2 open	I output ≈ 25 mA
wire 3 open	I output ≤ 4 mA
No sensor	I output ≈ 25 mA

Visual indication by flag

As an option, AMTROBOX R EEx ia can be equipped with a flag allowing to visualize the valve position at great distance, thanks to a melaminated sheet.



Submersible version

In this version, the top cover is without position visual indication.

Commissioning

Electric connection

The box can be delivered with a plug or a packing-gland

In standard version, it is equipped with one packing-gland M20 x 1.5 or M 25 x 1.5, metallic or plastic.

Gland capacity: cable external dia. 6 to 18 mm. Other gland capacities are possible.

The wiring is done on connecting terminal block max. area 2.5 mm².

Open the side cover to access to the terminal block by unscrewing with a wrench.

The good tightness of the box depends on cable selection and tightening of packing-gland. See wiring diagrams (pages 7, 8 and 9).

Screw the side cover with a wrench.

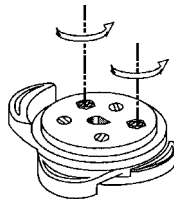
Adjustment of open/close detection

The limit switches or detectors are factory adjusted.

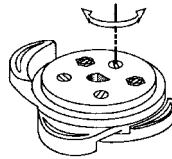
It is not necessary to re-adjust before valve mounting on site.

Nevertheless, if you wish to re-adjust after a maintenance operation, proceed as follows:

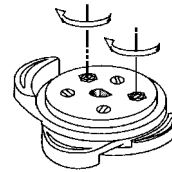
- Remove the top cover of AMTROBOX R EEx ia by unscrewing it with a wrench.
- Put the disc in extreme position (opening or closing).
- Unscrew the two metal screws one turn.
- Adjust triggering of the required detector by turning the coloured screw corresponding to the colour of the cam to adjust.
- Proceed in the same manner with the opposite switch.
- Each cam is adjusted independently and the adjustment does not affect in any way the adjustment of the other cam.
- When adjustments are completed, slightly tighten the two metal screws to prevent adjustments being changed.
- Replace the top cover of the box by screwing it with a wrench.



1 - Loosen the metallic screws



2 - Adjust the cams

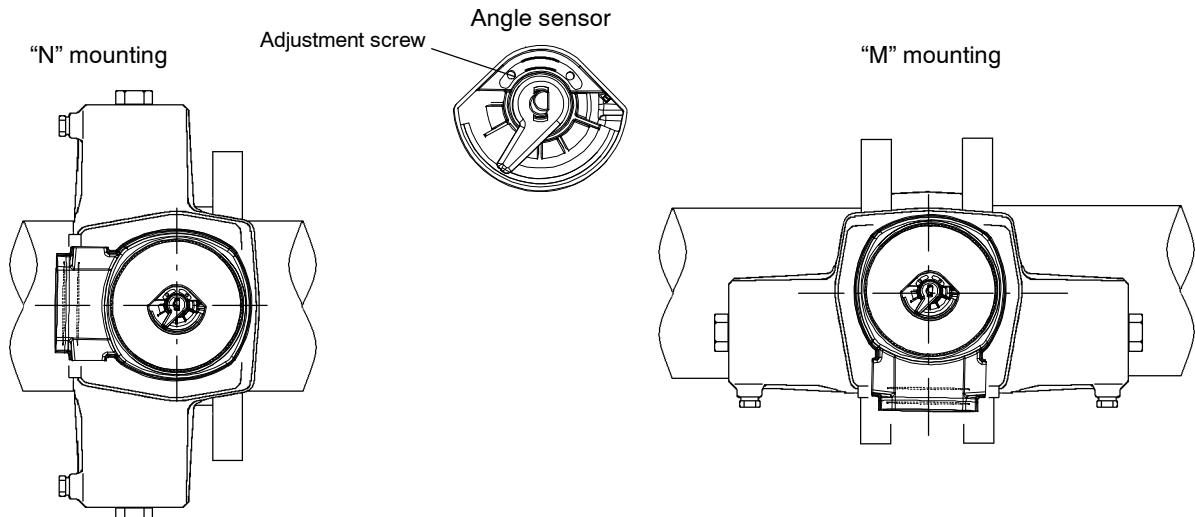


3 - Tighten the screws

Angle sensor adjustment

Following actuator position on the pipe ("N" or "M" mounting), angle sensor position must be adjusted.

Use a screwdriver to adjust the angle sensor position. See diagram below.



Mounting on actuator

AMTROBOX R EEx ia is fitted on the actuator according to VDI/VDE 3845 interface.

The four screws can be reached easily by opening the top cover.

The driving of the shaft is done by coupling on the actuator pinion.

Commissioning

**WARNING****CAUTION !**

The installation and start-up of the electro-pneumatic actuators must be according to the best safety practices and mainly:

Electric wiring:

- The electric components are "CE" marked in accordance with 2014/34/EU et 2014/30/EU european directives.
- The electric supply voltage and the electric values of the signals must be checked before connecting the components.
- The components of the intrinsically safe electric loops should be checked to ensure the inputs and outputs as well as wiring, do meet the regulations in force.
KSB-AMRI shall keep at the disposition of users the loop calculations for the recommended associated equipment.
- An external earth terminal allows grounding of the metal parts of the control box.

Never exceed the values stipulated in this leaflet!

The dust thickness on the box must not exceed 5 mm.

Do not open the box in dust atmosphere.

Do not clean using a compressed air gun to avoid sending dust in the atmosphere.

To remove dust, use a duster a little bit damp.

Also, always check that the fieldbus wires are disconnected before carrying out any disassembly.

During the mounting and dismantling of the boxes, take care the correct installation of all sealing gaskets.
Quality and integrity depends of this correct installation.

During workshop or on-site checking, the valve associated with the actuator and its AMTRONIC EEx ia box can be operated from full open to full closed position.

This operation may be of a high significant risk of personal injury if the safety steps required are not taken to prevent access between the disc and the seat.

EU Conformity Declaration



Hereby we,

KSB S.A.S.
Zone industrielle Gagnaire Fonsèche
24490 LA ROCHE CHALAIS
Registered Office: 92635 - Gennevilliers
France

declare that the automation boxes used in potentially explosive gaseous or dusty atmosphere and listed below comply with the requirements of the Directives 2014/34/EU et 2014/30/EU (EMC).

Description of automation boxes: - AMTROBOX R R1188

As per harmonized european standards: **Electrical equipment for potentially explosive atmosphere;**
 - EN 60079-0: 2012 + A11: 2013;
 EN 60079-11: 2012; EN 60079-31: 2014*
 *The current harmonized standards are different from standards used for certification (EN 60079-31: 2009) but this have no impact on the product.

Electromagnetic compatibility;
 - EN 61000-6-2 ; EN 61000-6-4

Electrical equipment suitable for: **Group II category 1G 2D or 2G 2D (1)**

Marking:



II 1 G Ex ia IIC T6 or T5 or T4 Ga (1)
II 1 G Ex ia IIB T6 or T5 Ga (1)
II 2 G Ex ia IIC T6 or T5 Gb (1)
II 2 D Ex tb IIIC T80 ° C Db

LCIE 04 ATEX 6075X

Ui : ...V; li : ...mA; Pi : ...mW; Ci : ...nF; Li : ...mH (1)
 ...° C ≤ Ambient temperature ≤ ...° C (1)

(1) : marking depending on the internal equipment,
See special condtions for safe use.

Manufacturing Quality Assurance notification

LCIE 03 ATEX Q 8078

Name and address of the authorizing and monitoring notified body:

L.C.I.E.
33, avenue du Général Leclerc
92266 FONTENAY-AUX-ROSES CEDEX
FRANCE

Number of notified body: **0081**
 Michel Delobel

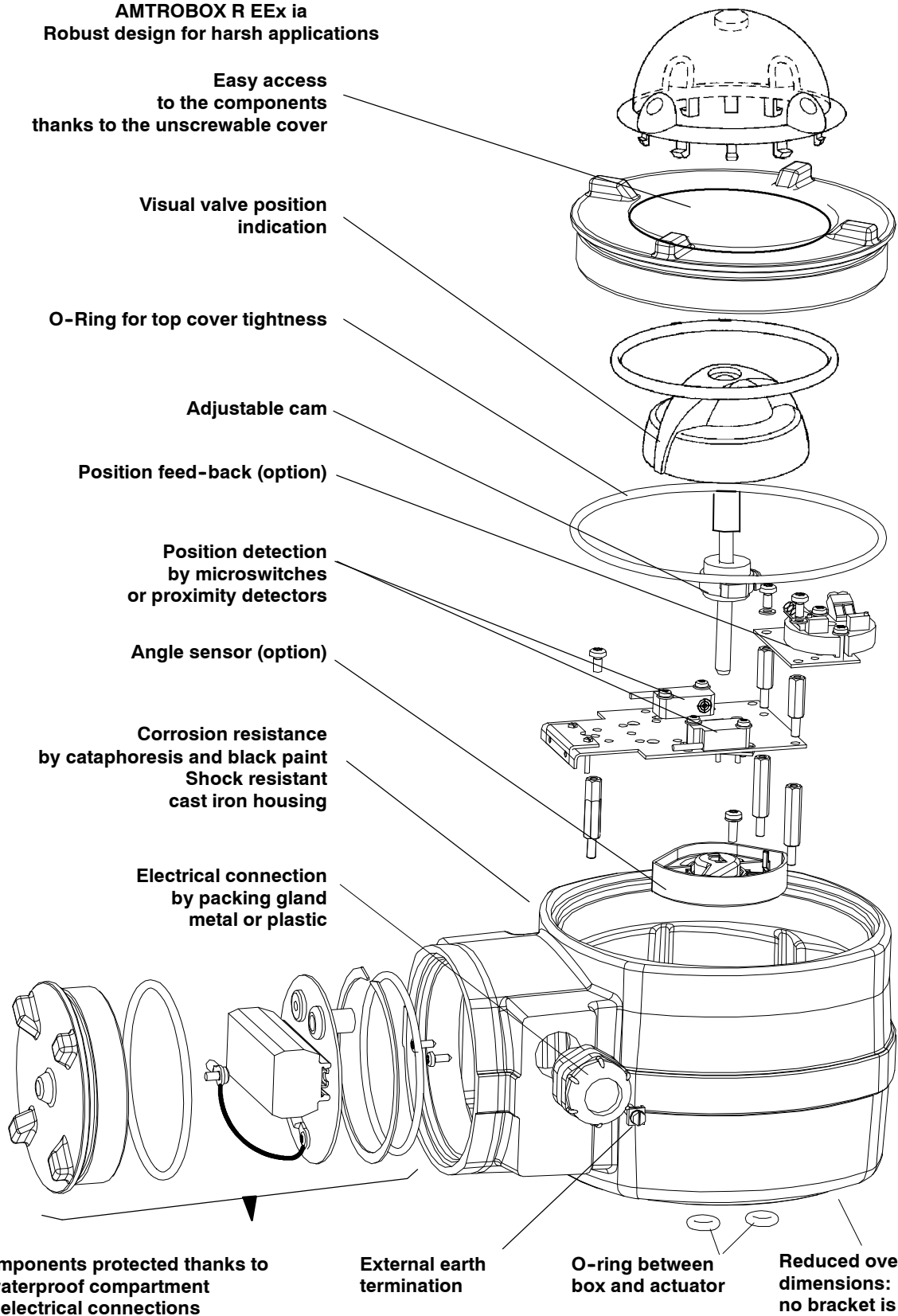
Quality Assurance

11/18 - rev. 6

This electronic document is valid without signature. Disclosure grants its validity.

Product features - to our Customers' Benefit

AMTROBOX R EEx ia
Robust design for harsh applications



Easy access
to the components
thanks to the unscrewable cover

Visual valve position
indication

O-Ring for top cover tightness

Adjustable cam

Position feed-back (option)

Position detection
by microswitches
or proximity detectors

Angle sensor (option)

Corrosion resistance
by cataphoresis and black paint
Shock resistant
cast iron housing

Electrical connection
by packing gland
metal or plastic

Components protected thanks to
a waterproof compartment
for electrical connections

External earth
termination

O-ring between
box and actuator

Reduced overall
dimensions:
no bracket is necessary

Intrinsically safety - Protection level IP 68

This leaflet is not contractual
 and may be amended without notice.

07.11.18

8524.11/16-EN