XL/BW/BRW-2 Indicators
USER'S MANUAL

- Input and wiring
- Mounting
- Commissioning

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Document no.: 4189350024M

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1. Introduction

This document gives guidelines for mounting, connecting and commissioning the XL or BW/BRW-2 instruments. XL and BW/BRW-2 instruments are different from the well-known instruments based on a moving coil system. The XL and BW/BRW-2 instruments are based on a so-called x-coil system with a rotating magnet placed in the centre of two coils surrounding the magnet. The combination of a microcontroller and the cross coil system forms a unique instrument with a very high linearity. The major difference, compared with the traditional instruments based on a moving coil system, is that the XL and BW/BRW-2 instruments must be connected to a 24 V_{dc} supply. This supply is power for the built-in electronics. Because the XL and BW/BRW-2 instruments are based on a microcontroller, it is now possible also to use data communication as input instead of traditional analogue current or voltage signals.

Unpacking

The XL/BW/BRW-2 indicators are delivered in a cardboard box. To protect the indicator it is important to store it in the box until mounting.

The indicators are protected against ESD (static electricity). Therefore, in the process of mounting and wiring of the indicator, no special attention towards ESD is needed.

For the XL types, the box also contains a number of fixing clamps. The exact number of clamps depends on the indicator size and the degree of IP protection.

If the indicator is mounted for IP66 protection, a gasket (blue) for IP66 protection will be included. The contents should be as described in the table below.

For **bulkhead mounted** types (BW/BRW-2), the box also contains a bracket with two 8 x 12 mm screws for fixing the bracket on the bulkhead box (5 mm Allen key).

Content	XL72	XL96	XL144	XL192	BW144	BW192	BRW-2
Quick guide	1	1	1	1	1	1	1
Indicator	1	1	1	1	1	1	1
Terminals, see note below	2/3	2/3	2/3	2/3	2/3	2/3	2/3
Rear mounted version, fixing clamps IP52/IP66	2/4	2/4	4/8	4/8			
Gasket IP66 option	1	1	1	1			
Front mounted version, frame	1	1	1	1			
Gasket IP66 BW/BRW-2					1	1	1
Rear cover with bracket					1	1	
Screws for rear cover					8	8	
Bracket with 8 x 12 mm screws					2	2	4

If the indicator is arranged for CANopen input, a 3 terminal block for illumination input is included + one CAN cable fixing plate.

XL with IP66 protection

When the indicator is to be mounted for IP66 protection, a blue gasket is included.

BW/BRW-2 IP66 protection

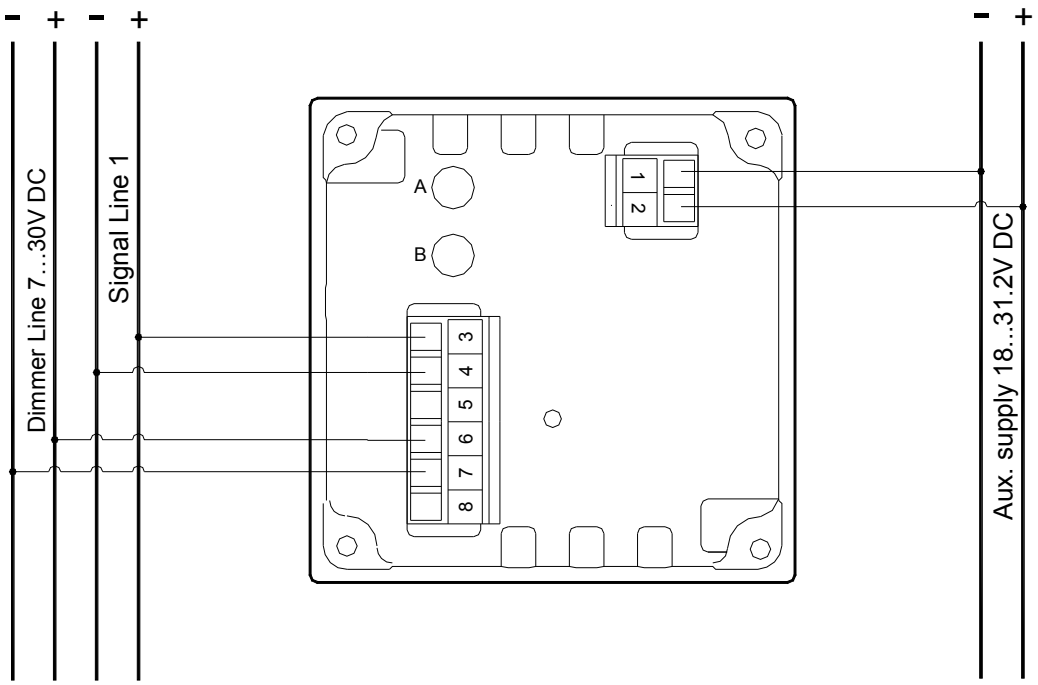
A black or blue gasket is always included.

2. Input and wiring instruction

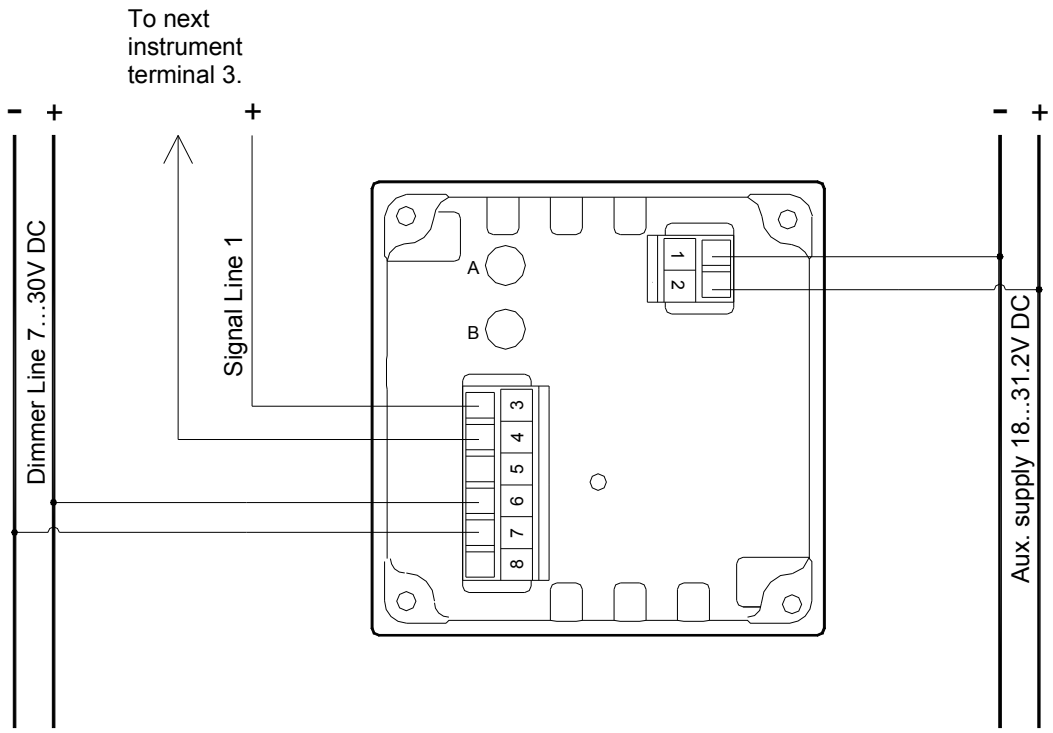
Analogue input

Pin number	Function		Note
1	Supply voltage	0 V	Consumption max. 150 mA
2		24 V	
3	Analogue input	Input 1 (Sin)	Input 1 and GND used for single input
4		GND	On 4 to 20 mA, input 1 is CW and input 2 CCW
5		Input 2 (Cos)	**Note: GND is mutual for input 1 and input 2**
6	Illumination	Illumination +	Dimmer input. Dimmer range 7 to 30 V_{dc}
7		Illumination GND	Consumption max. 30 mA
8	-	NC	Not connected - can be used freely
A	Analogue adjustment	Max. adjustment	Max. and zero adjustment, sealed by label
B		Zero adjustment	On 360 degree versions, A is EM selection and B is zero adjustment

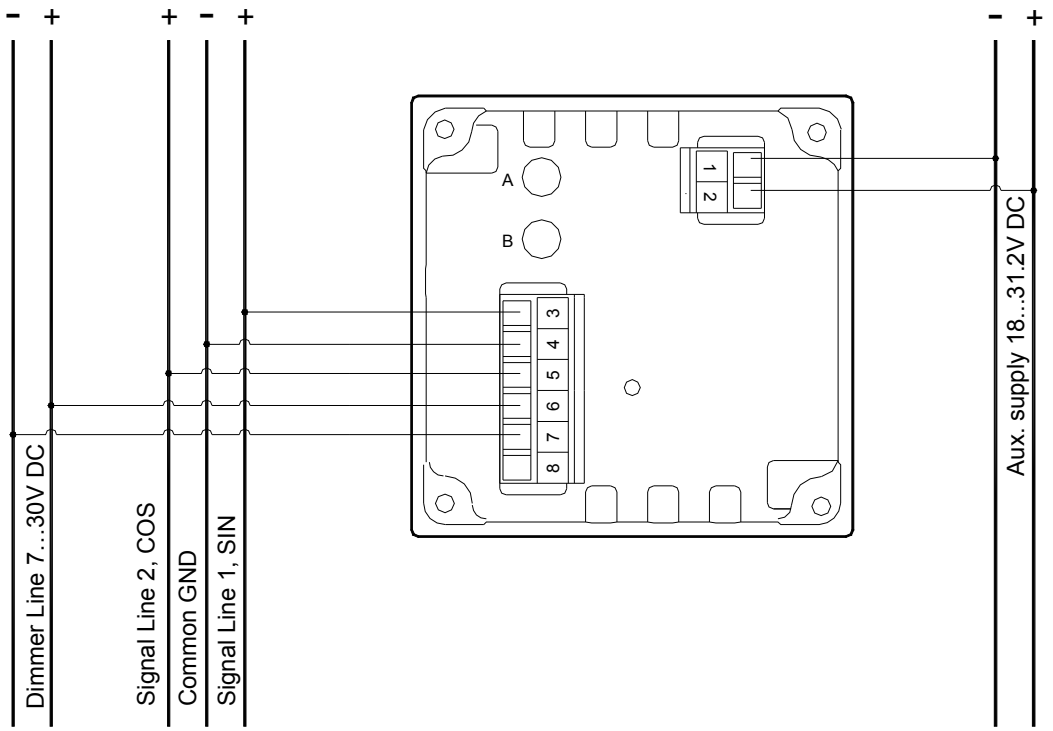
VOLTAGE single input



CURRENT single input

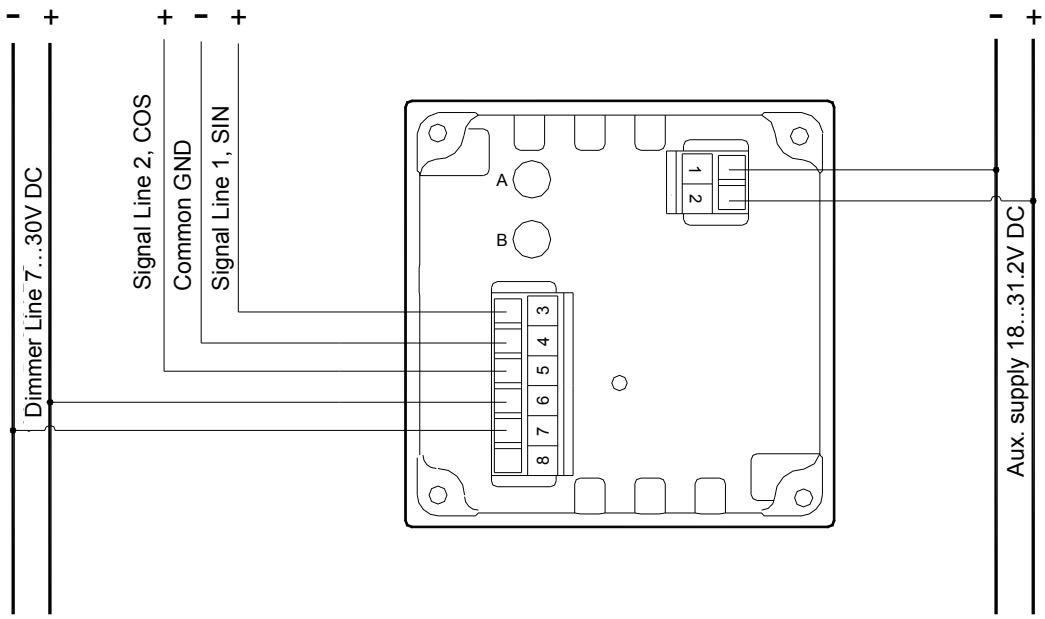


Analogue SIN/COS input voltage (dual input)



Analogue SIN/COS input current (dual input)

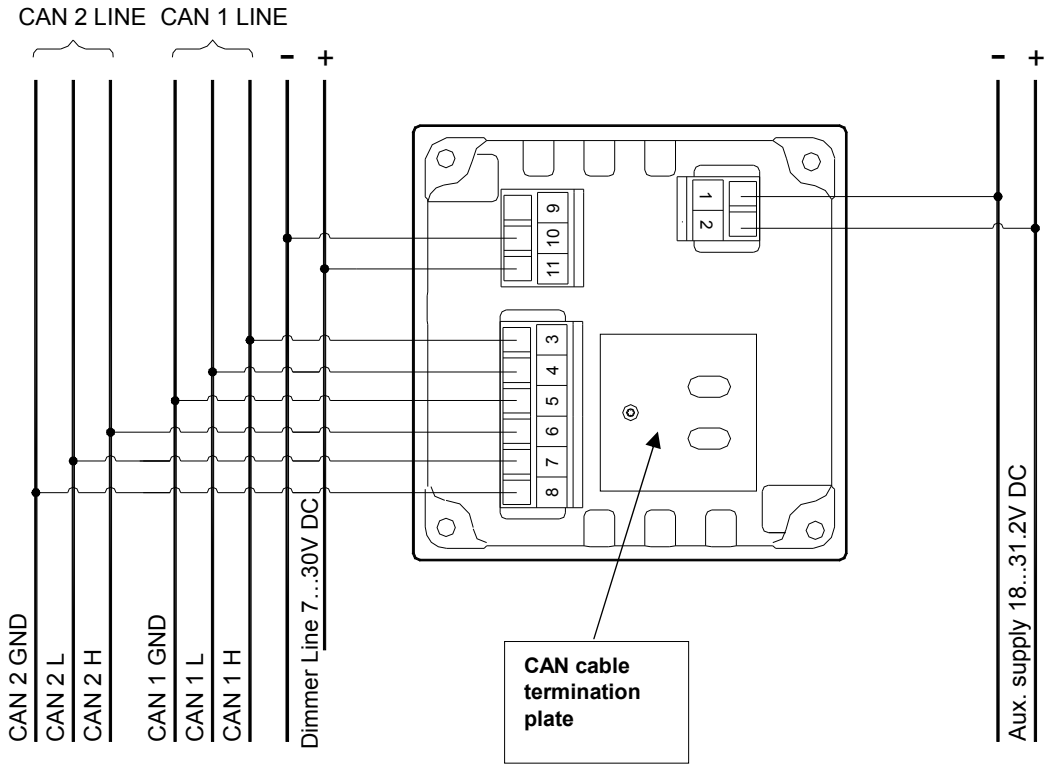
Please notice that this version is not standard.



Only one instrument can be connected in the current loops.

Dual CANopen input

Pin number	Function		Note
1	Supply voltage	0 V	Consumption max. 150 mA
2		24 V	
3	CAN connection	CAN 1 H input	CAN 1 line
4		CAN 1 L input	
5		CAN 1 GND	
6		CAN 2 H input	CAN 2 line
7		CAN 2 L input	
8		CAN 2 GND	
9	Illumination analogue dimmer	NC	Dimmer input. Dimmer range 7 to 30 V_{dc} Consumption max. 30 mA
10		Illumination GND	
11		Illumination +	



The plate shown at the arrow is for fastening the CAN cables by means of two strips. The strips are not included. Keep the isolation on the cables, so the screens are not mutually connected.

CAN GND

In general, CAN 1 GND and CAN 2 GND should not be connected. In case of noisy environments the cable screen from CAN cable 1 and 2 can be connected to input CAN 1 GND and to input CAN 2 GND on the indicator respectively.

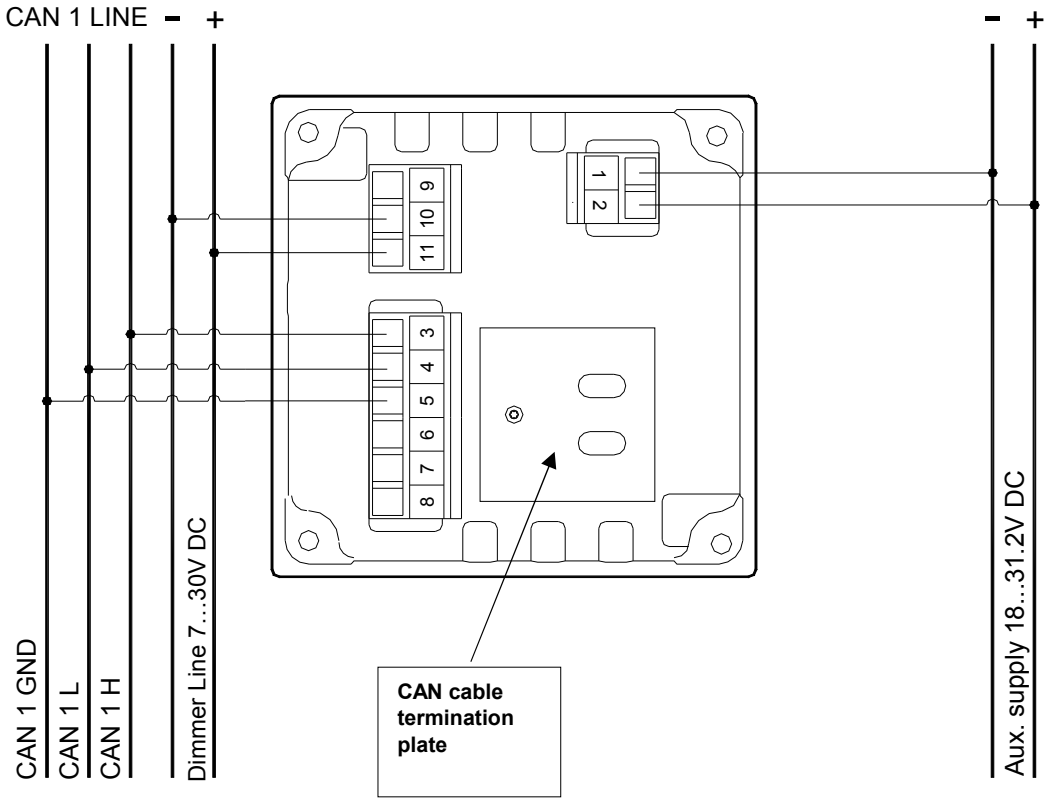
It is recommended that the two cable screens for CAN 1 and CAN 2 are not connected.

Regarding termination of the CANopen line, please see chapter 6, Commissioning.

Remember to terminate both ends of the CANopen line by means of a 120 Ohm resistor.

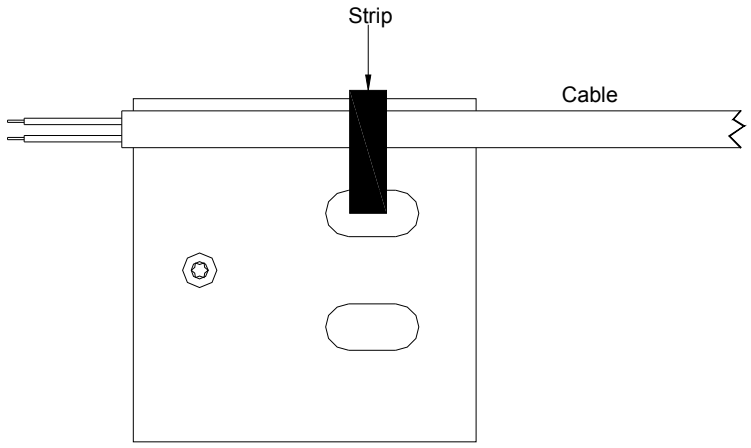
sCAN (single CAN) input

Pin number	Function		Note
1	Supply voltage	0 V	Consumption max. 150 mA
2		24 V	
3	CAN connection	CAN 1 H input	CAN 1 line (sCAN line)
4		CAN 1 L input	
5		CAN 1 GND	
6		Not used	Used for setting of min/zero/max with external switch (Pin 7-8). See section 6 for info.
7		Switch/button	
8		GND	
9	Illumination analogue dimmer	NC	Dimmer input. Dimmer range 7 to 30 V_{dc} Consumption max. 30 mA
10		Illumination GND	
11		Illumination +	



Optional calibration switch and resistor not shown, see Commissioning section 6 for details.

The plate shown at the arrow is for fastening the CAN cable by means of a strip. The strip is not included.



In general, CAN 1 GND should not be connected. In case of noisy environments, try to connect the cable screen to CAN 1 GND. Please also see chapter 6, Commissioning.

Dimmer setup, analogue versions

The figures below illustrate the different ways of arranging a local dimmer on the XL indicators.

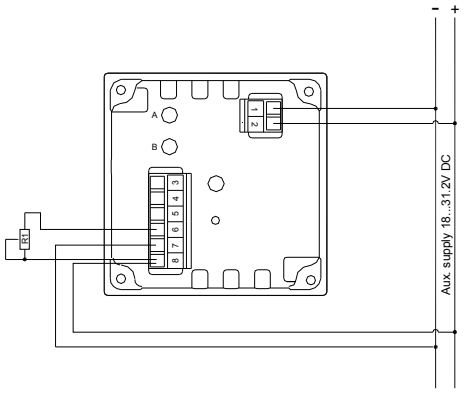


Figure 1

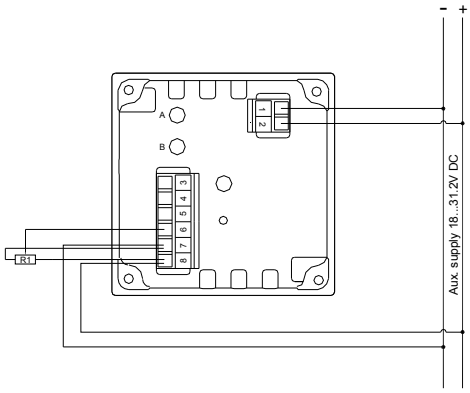


Figure 2

Figure 1 illustrates a method for dimmer connection that adds a 10 kOhm potentiometer in series with the illumination input (terminal 6). This method is preferred, if the consumption has to be kept low. However, it is a disadvantage that the illumination cannot be set to total darkness.

Figure 2 illustrates a method for dimmer connection that adds a 1 kOhm potentiometer as a voltage divider. This method has the advantage that the illumination can be set to total darkness. The disadvantage is that the consumption of the potentiometer is approximately 24 mA, even if illumination is set to total darkness.

It is also possible to use an external voltage for dimming the illumination. The regulation range from darkness to full illumination is 7...30 V_{dc}. The consumption is 30 mA at 30 V_{dc}.

For BW/BRW-2 instruments the dimmer potentiometer is as default mounted as 10 kOhm as in figure 1.

Dimmer setup, dual CANopen interface

The illumination can be controlled from the CANopen line or by the dimmer line on terminals 10 and 11.

To be able to control the illumination over the full range by means of the CANopen line, it is important that the voltage level on terminals 10 and 11 is approximately 24 V. This can be accomplished simply by connecting terminal 10 to terminal 1 and terminal 11 to terminal 2 using the aux. supply voltage as voltage input for the illumination (figure 3).

If the illumination is controlled from the dimmer line, the CANopen parameter for illumination must be set to 100 % (factory setting). Because the two systems influence each other, it is possible to adjust the illumination from both sources at the same time.

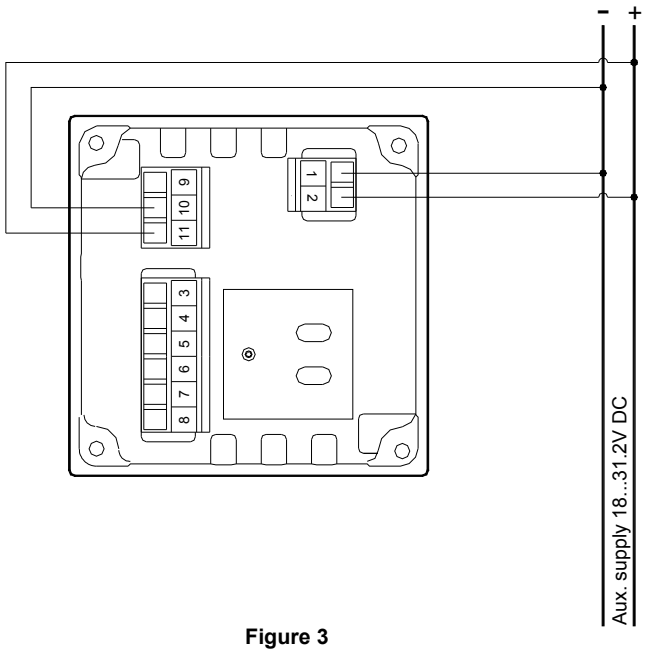


Figure 3

Dimmer setup, for indicators with sCAN interface

The illumination can only be controlled from the dimmer line on terminals 10 and 11.

A dimmer potentiometer (R1) can control one or several indicators, like the analogue types. As pin 9 is not used internally, it can be used as a wire junction point for easier wiring (figure 4).

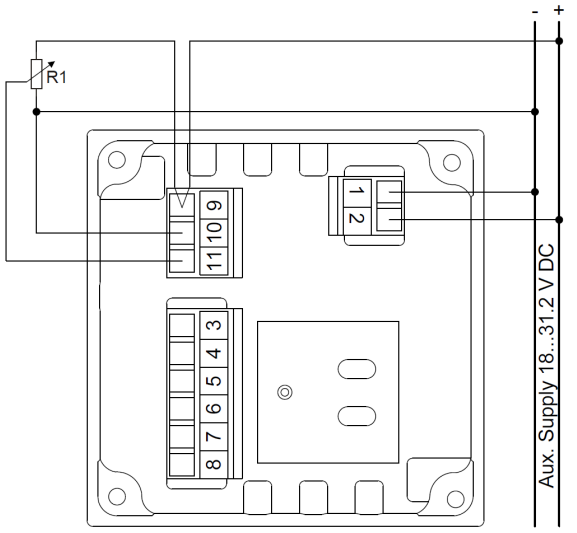
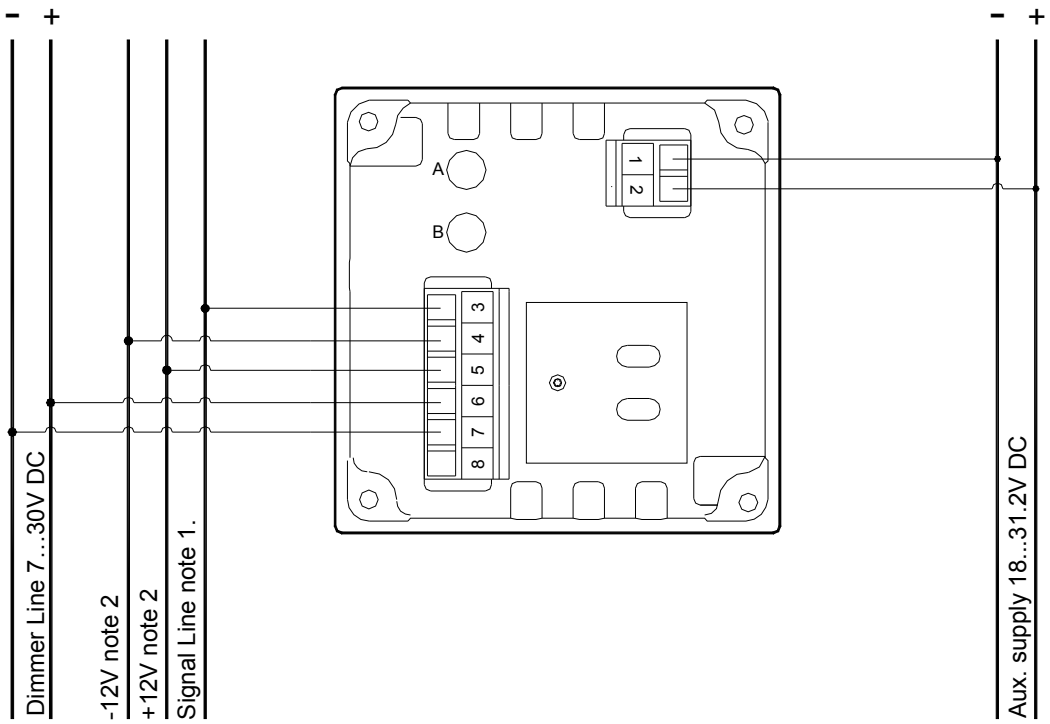


Figure 4

3. Rudder potentiometer input (3-wire)

Analogue input

Special input for direct connection to rudder potentiometer. Be aware that this is not standard functionality.



Please notice that:

1. The signal line is identical to the signal on the rudder potentiometer wiper
2. The -12 and +12 V_{dc} (24 V_{dc}) can be the same voltage as the aux. voltage

As standard the aux. voltage can be between 18…31 V_{dc}. In cases where the aux. voltage is used for the -12 V and +12 V, this voltage must be stabilised and not higher than 25 V, and the same voltage must be used for supplying the rudder potentiometer itself.

Adjustment

The min. potentiometer (B) can be used to correct the zero position; e.g. if the rudder is located in centre position (0°), then the reading on the indicator can be corrected to indicate 0°.

The max. potentiometer (A) can be used to correct the max. position; if the rudder is turned to max. port side or starboard side, then adjust by means of the potentiometer marked A until correct reading on the scale. The max. potentiometer has an extended adjustment range in the above version; the span can be adjusted to cover ±7.5 V to ±12.5 V.

For adjustment of indicators with standard analogue input, please see chapter 6, Commissioning.

4. Mounting instructions

General

When the product is for outside mounting (e.g. on open bridge wings), it is very important to use the product correctly and select the optimum position. In general, it is not recommended to use indicators with black scale base for outside use. Depending on the position, this might bring the product outside temperature specifications and cause damage to the product and thus loss of the warranty. So this should be avoided!

Placed in direct sunlight, a black scale base indicator will be significantly hotter inside than an indicator with a white scale base. Therefore the mounting position must be carefully selected, and measures must be taken to protect the indicator from direct sunlight, if possible.

XL

Mounting follows the standard DIN mounting for indicators. Use the fixing clamps to mount the indicator from the rear. Indicators with IP52 protection use two clamps for size 72 and 96 and four clamps for size 144 and 192. If the indicator is mounted according to IP66, use the gasket and all the clamps supplied, so the pressure on the gasket becomes uniform. See appendix for further information regarding indicator outlines.

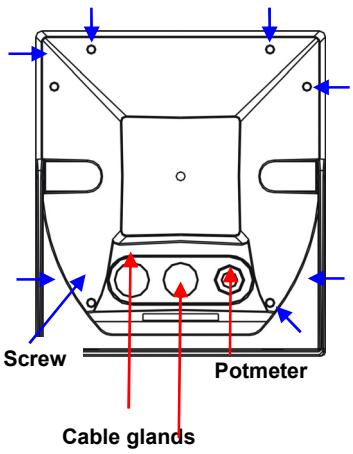
It is very important to carefully mount the included (blue) gasket correctly in the groove on the frame; the flat side goes into the groove with the rounded side oriented outwards.
Ensure that the gasket is evenly mounted and not capsized.

Bridge Wing type BW

To access the terminals, the bulkhead box must be removed by unscrewing the eight screws located on the rear side of the box. To reach the screws, use tool torx T10, long bit (50 mm).

These screws are delivered in a bag.

Having unscrewed the bulkhead box, the indicator can be taken out of the box. The installation of the BW terminals is identical to the description for XL instruments (see chapter 2).



The bulkhead box is equipped with two PG cable glands:

BW144: PG9 (cable gauge: 5.0-8.0 mm)
BW192: PG16 (cable gauge: 8.0-14.0 mm)

On delivery from DEIF, the two PG glands are sealed with protection blind plugs.

The PG glands cannot be changed to another size or type, as they are a vital part of the IP66 protection.

If the gauge of the installation cable is different from the above-mentioned, a junction box must be used to accomplish connection to the installation.

Remember to fasten the nut on the PG glands.

In addition to the PG glands, the bulkhead box is equipped with a potentiometer. This potentiometer is used for local dimmer for the indicator. See the description for dimmer in chapter 2.

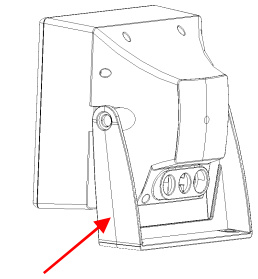
When the wiring is done, the indicator is remounted in the bulkhead box using the eight screws. Recommended torque for the screws is 0.8 Nm (±0.2). The included (black) gasket/frame is mounted in the groove on the indicator frame with the rubber rim side into the groove.

For fixing the entire indicator via the bracket, use two appropriate screws. These screws are not included.

The bracket is not symmetrical and can therefore be arranged in two different ways.

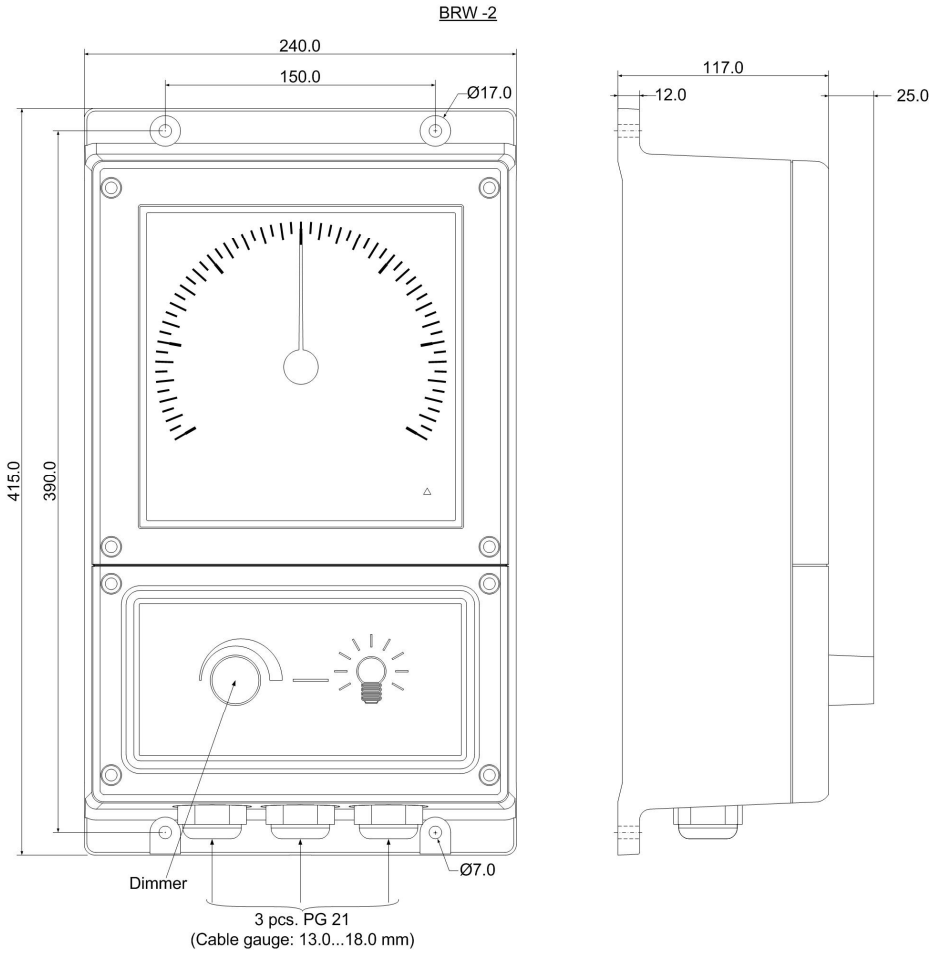
Same distance between bracket screw holes on BW144 and BW192 (125 mm). See chapter 5.

The distance between bracket screws is made, so the BW can replace the old VTR-3 and VTR-5.



Bracket

Bridge Wing type BRW



Connection

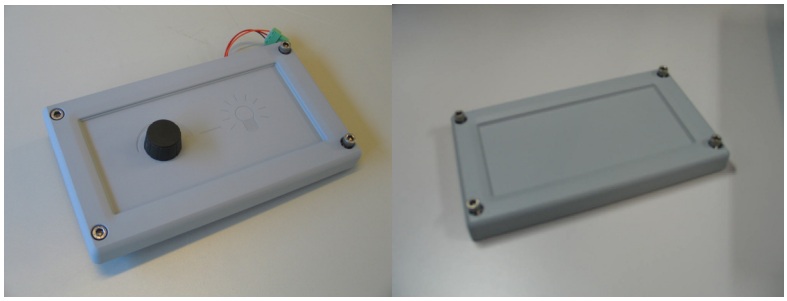
BRW-2 is protected from ESD (static electricity), so no special protection from ESD is needed during mounting.

Dismount the potentiometer plate (use a standard 4 mm Allen key), and the connection terminals will be visible. Be careful not to damage the gasket when the potentiometer plate is dismounted from the housing.

Cable dimensions between 0.2 and 2.5 mm^2 multi-stranded or max. 4 mm^2 single-stranded can be used for the screw terminals. Cable entry is obtained via three PG21 glands. Cable dimensions 13-18 mm is possible with PG21 gland.

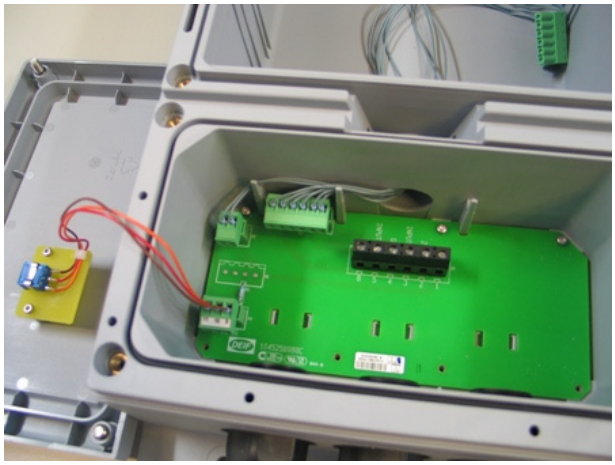
The PG glands cannot be changed to another size or type, as they are a vital part of the IP66 protection.

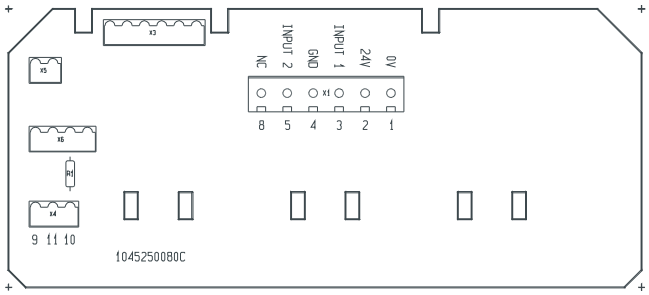
Front cover for versions with built-in dimmer (right) and without dimmer (left):



If version without built-in dimmer is used, external dimmer can be connected by using X4, see connection table.

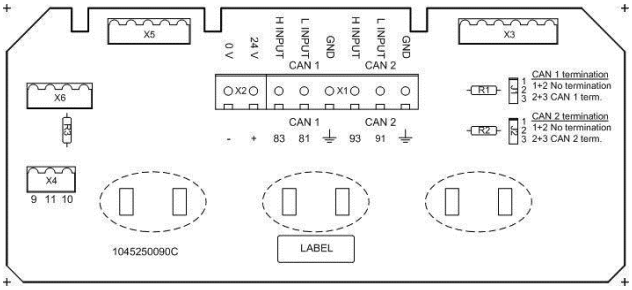
Connection interface board BRW-2, analogue input:





Pin number	Function		Note
1	Supply voltage	0 V	Consumption max. 150 mA
2		24 V	
3	Analogue input	Input 1 (Sin)	Input 1 and GND used for single input On 4 to 20 mA, input 1 is CW and input 2 CCW **Note: GND is mutual for input 1 and input 2**
4		GND	
5		Input 2 (Cos)	
8	NC		No connection
9	X4 connector Illumination	Orange wire	Dimmer potentiometer (10 kOhm)
10		Brown wire	
11		Red wire	Wiper on the dimmer potentiometer
A	Analogue adjustment	Max. adjustment	Max. and min. adjustment, sealed by label Located on the rear of the XL192
B		Min. adjustment	

Connection interface board BRW-2, CANopen interface:



Use strips to terminate cable shields to PCB to avoid noise (see the dashed circles). Jumpers J1 and J2 are used as end resistors (terminations) of CAN 1 and CAN 2.

Pin no.	Function		Note
GND	CAN connection	CAN 1 GND	CAN 2 line/or for external switch for calibrating sCAN (see user manual)
L input		CAN 2 L input	
H input		CAN 2 H input	
GND		CAN 1 GND	CAN 1 line (sCAN line)
L input		CAN 1 L input	
H input		CAN 1 H input	
24 V	Supply voltage	24 V_{dc}	Consumption max. 150 mA
0 V		0 V_{dc}	
9	X4 connector Illumination	Orange wire	Dimmer potentiometer (10 kOhm)
10		Brown wire	
11		Red wire	Wiper on the dimmer potentiometer

Replacement of XL192 instrument in BRW-2

1. Dismount the top frame by removing the four screws from the frame.
2. Take out the XL instrument (and note the measuring range on the product label).
3. Disconnect the mounted cables.
4. Mount the new XL instrument.
5. Mount the cables to the new XL instrument.
6. Place the gasket between the XL instrument and the base.
7. Mount the top frame.
8. Fasten the four screws in the frame. Recommended torque for the screws is 4.5 Nm (±0.2).

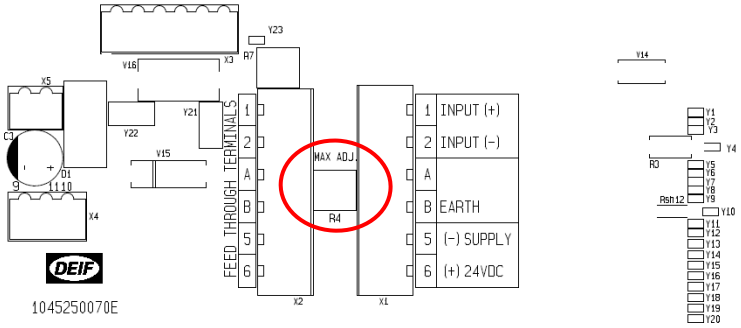
Note that the replacement XL192 should be ordered as an IP66 version if the original gasket is damaged!

BRW-2 replacement type

This product is only relevant for replacement of existing BRW-1 products.

Standard voltage for supply and illumination is 24 V_{dc}. Connect the illumination supply 24 V_{dc} to terminals pos. 5 and 6. For personal protection, the terminal marked "EARTH" must be connected to the ship's hull. This is also recommended in order to avoid static electricity influencing the instrument accuracy.

The potentiometer marked "MAX. ADJ" located between the two connectors can be used for small adjustments of the deflection of the instrument (ONLY available on the replacement PCB 1045250070C) to fit the scaling of the indicator to the existing installation.

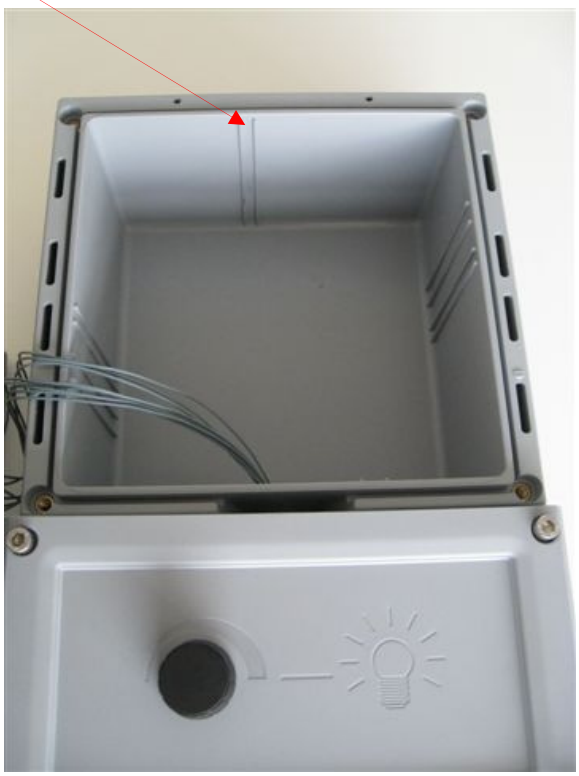


The potentiometer R4 is used for fine adjustment of the deflection. The special replacement type has an accuracy of class 1.0 due to the external adjustment potentiometer R4.

Please note, that when replacing the XL192 indicator built into the BRW-2, the measuring range is either 0-1 mA or ±1 mA. Please see the type label on the XL192 indicator.

Adjustment help, analogue input

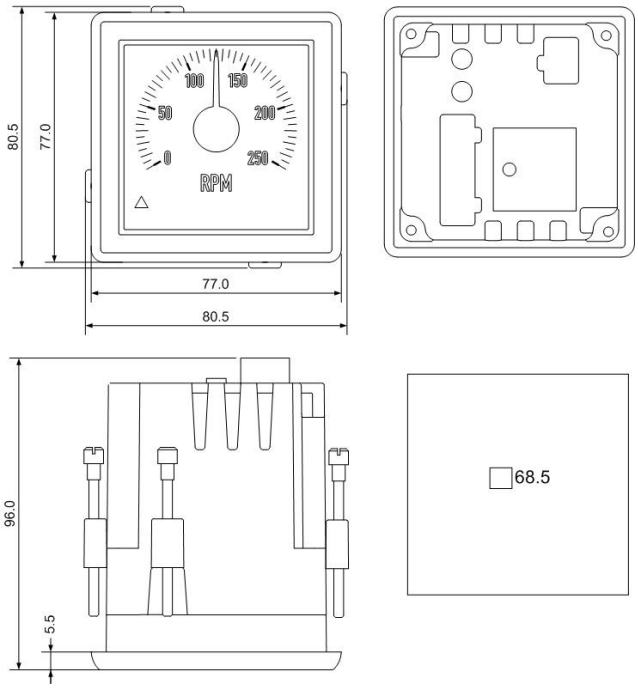
A special feature has been added to help the installer during adjustment of the BRW-2 analogue type. When the XL192 has been removed for adjustment on the rear side, the instrument can be placed in the grooves in the BRW-2 housing, which facilitates adjustment, as the installer has both hands free.



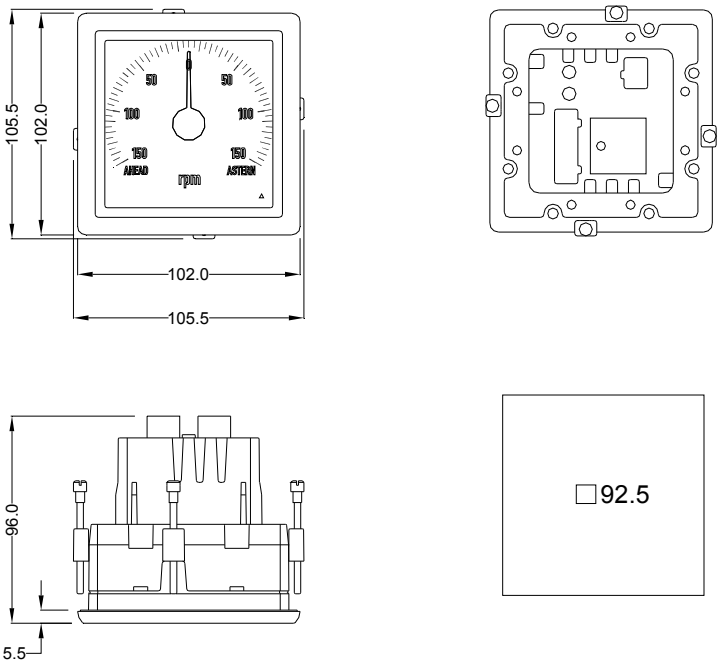
5. Dimensions

XL dimensions in mm.

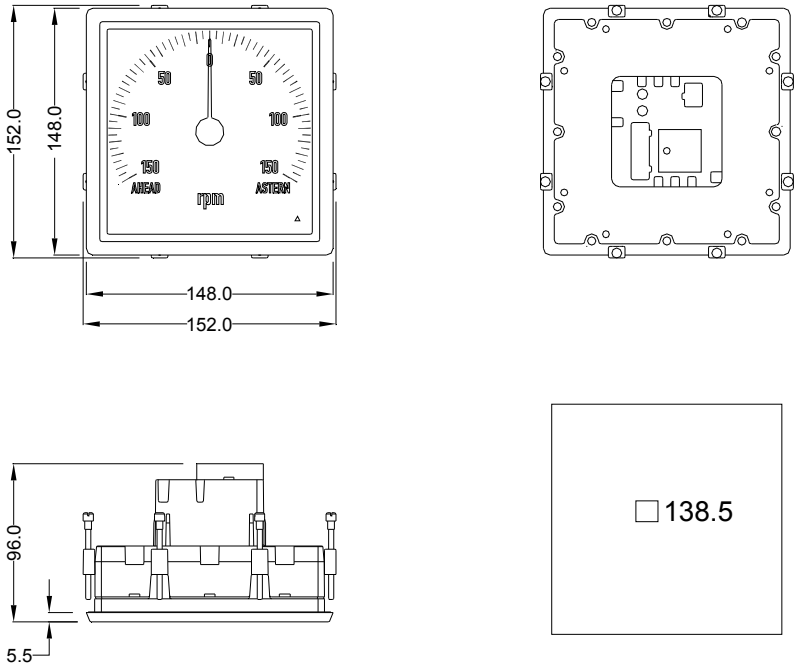
XL72



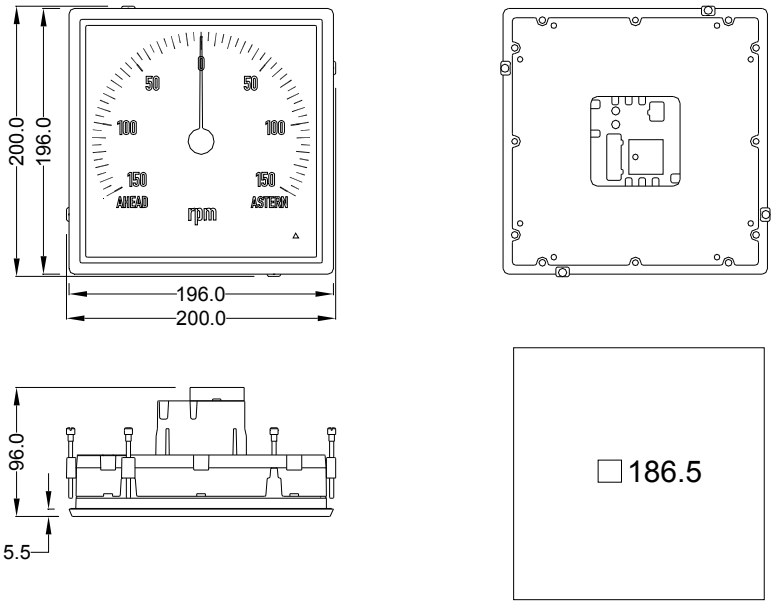
XL96



XL144

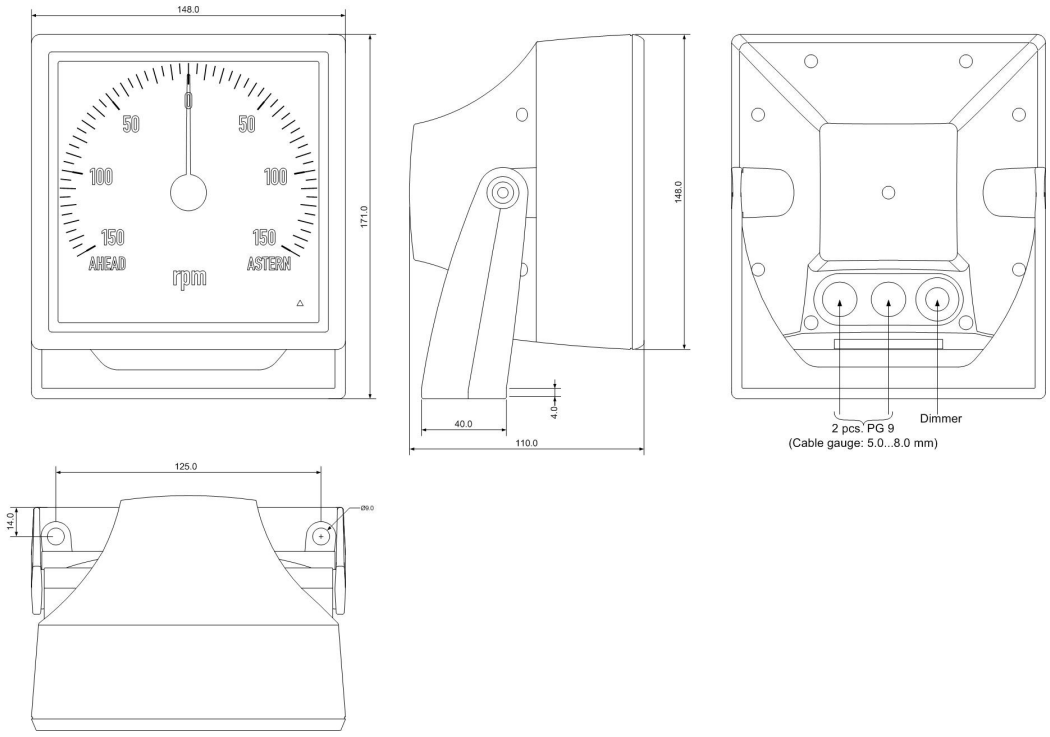

152.0
148.0
0
50
50
100
100
150
150
AHEAD
ASTERN
rpm
148.0
152.0
96.0
5.5
□138.5

XL192

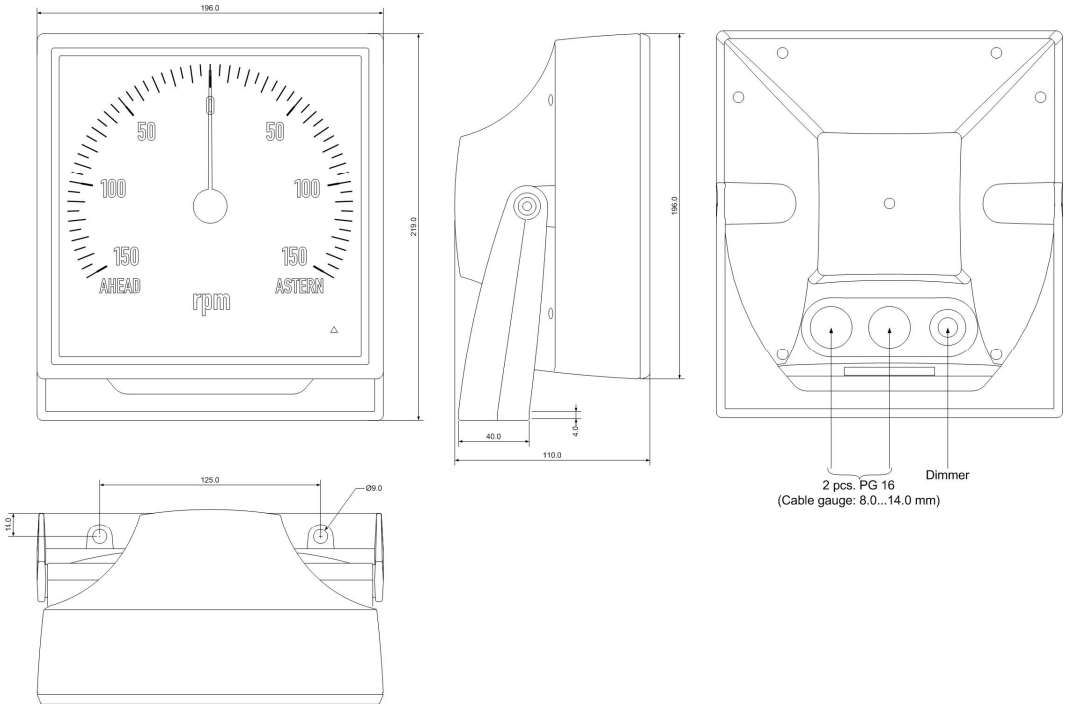

200.0
196.0
0
50
50
100
100
150
150
AHEAD
ASTERN
rpm
196.0
200.0
96.0
5.5
□186.5

BW dimensions in mm.

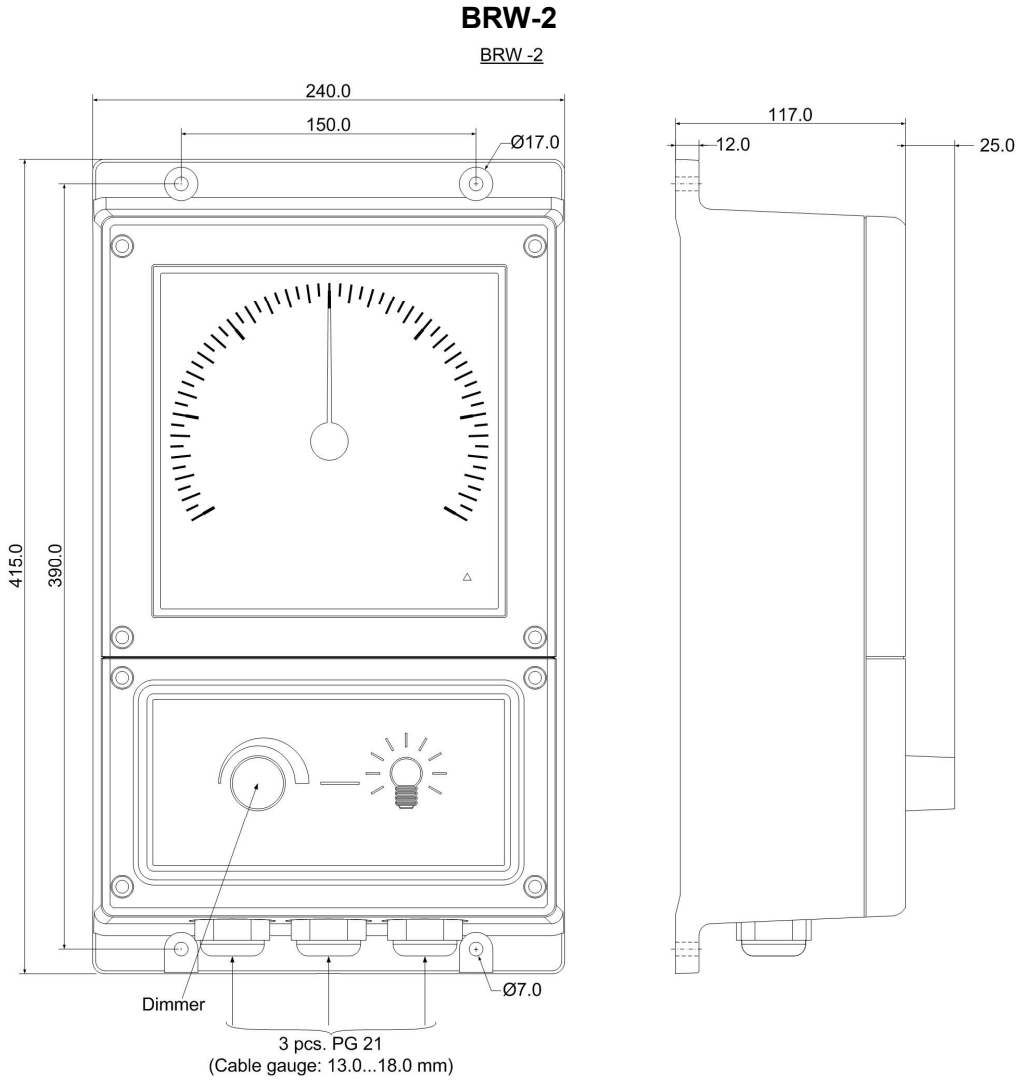
BW144



BW192



BRW-2 dimensions in mm.



The 3 PG glands are sealed from DEIF with protection blind plugs.

If BRW-2 is ordered without internal dimmer, a separate IP66 dimmer box can be ordered or a dimmer kit for panel mounting is also a possibility:

Item number:	Part:	Description:
2951890020-01	Dimmer box	External dimmer box for indicators, 10 kOhm potentiometer in IP66 plastic box with PG13.5/PG16 cable glands
2951890020-02	Dimmer kit	Dimmer potentiometer (1 kOhm) and fittings for panel mounting

6. Commissioning

General

When the indicator is without power, the pointer position is random.

When power is applied, the pointer will be out of control for a few seconds. This is normal operation.

Do not remove the protective plastic from the front window until the installation has been approved by the class surveyor. This will make his job easier.

Analogue version

The XL and BW/BRW-2 indicators are equipped with an amber LED indicator located in the corner of the scale.

After power-up, the LED is flashing once every second, and after two seconds the LED is turned off. If there is an internal error, e.g. the microprocessor is stopped, the LED will continue flashing. This cannot be corrected, and DEIF Customer Service must be contacted.

After power-up and in case of incorrect input signal connected to the indicator, e.g. input signal is below minimum or higher than maximum, the pointer will indicate the out-of-range condition after two seconds by moving pointer to the error position. This will continue until the input is adjusted to be within the nominal input range. If the indicator is with a 360° scale, the faulty input will also be indicated by a flashing error LED.

The working range is -2 % to 102 % of nominal input range, and outside this range the pointer will indicate "out of range".

For further information regarding fault indication, please see section concerning error handling.

Special 4 to 20 mA functionality

The 4 to 20 mA single version has a special feature which makes it possible to change the pointer deflection from CW (4 to 20 mA on terminals 3-4) to CCW (20 to 4 mA on terminals 5-3).

The selection between the two inputs is done during each power-up of the indicator:

- During power-up, the two inputs are searching for a valid input signal. A valid input is in the range of 5 to 20 mA. When a valid signal is detected on one of the inputs, this input is then "locked" as the only input used.

Please note that:

- Due to product tolerances, the minimum input for valid detection is between 4 and 5 mA, so, to ensure detection, use 5 mA as minimum
- When valid input is present at both inputs simultaneously, no selection is made. So make sure that you only attach input to the desired input terminals.
- At each power-up, the product is searching for valid input.
- Even if input terminals 5-4 (CCW) are used, the indicator will always start up with a pointer position as shown in chapter Pointer positions for illustration, "Error position (min.)", until an input value >4 to 5 mA is present.

Adjustment of single analogue input

The zero point can be adjusted by means of the potentiometer named B. With a signal close to minimum input, e.g. -10…0…10 V input, the corresponding point on the scale is adjusted using -9.5 V as input signal. Then connect +9.5 V to the input and adjust to correct reading by means of the potentiometer named A. Indicators with scale zero at scale midpoint must be adjusted to scale zero with B (zero) adjustment.

When the XL instrument is connected to a rudder transmitter, some adjustment may be necessary to match the indicator precisely to the transmitter. First, turn the rudder to give an input signal close to minimum and adjust the reading on the scale by means of B (zero), then turn the rudder to give an input close to maximum and adjust the reading by means of A (max.).

It is not recommended to perform the minimum and the maximum adjustment with an input signal corresponding exactly to min. and max. input, e.g. if the input signal is 0 V when adjusting a 0…10 V instrument, the potentiometer named B will not give any adjustment below the corresponding zero point on the scale, and there is a risk of adding an unwanted offset causing a linearity error over the whole scale. The same goes for the maximum adjustment.

Minimum adjustment must be performed before maximum adjustment.

Adjustment functionality

XL type:	Potentiometer A:	Potentiometer B:
240 degree pointer	Maximum (or gain) adjustment Range: Approx. ±20 % of full scale Only use this when the pointer is in maximum position!	Zero (or minimum) adjustment Range: Approx. ±10 % of full scale Use this for zero correction in minimum or midpoint position
360 degree pointer	At fully CW, the EM (electrical mid) is as standard. At fully CCW, the EM changes to +180 degrees of standard	+/-10 degree digital offset of the pointer/disc, similar to a mechanical adjustment on a moving coil indicator

Remember that the maximum position is fully CW on CW types and fully CCW on CCW types!

If you need to revert to close to factory settings on the adjustment, place the potentiometers in mid position.

Out-of-range definition

When the input is more than 2 % outside the nominal range (-2 to 102 %), the pointer moves to "out-of-range" position. See the table in chapter Pointer positions for illustration.

Examples:

Out-of-range (low):	Working/nominal range (4 to 20 mA):	Out-of-range (high):
<3.60 mA = Error	3.60 to 4.00 to 12.00 to 20.00 to 20.40 mA	>20.40 mA = Error

Out-of-range (low):	Working/nominal range (0-10 V):	Out-of-range (high):
<-0.2 V = Error	-0.2 to 0.0 to 5.0 to 10.0 to 10.2 V	>10.2 V = Error

Out-of-range (low):	Working/nominal range (±10 V):	Out-of-range (high):
<-10.2 V = Error	-10.2 to -10.0 to 0.0 to 10.0 to 10.2 V	>10.2 V = Error

The 2 % value is calculated from the maximum input value.

sCAN version

The XL and BW/BRW-2 indicators are equipped with an amber LED indicator located in the corner of the scale.

After power-up, the LED is flashing once every second until a valid CAN signal is present. Then the LED is turned off.

In the sCAN version, some basic setting can be performed on the system/indicators:

- Zero setting
- Minimum value setting
- Maximum value setting
- CW or CCW pointer movement selection

Putting the indicator in set-up mode

The normally unused CAN 2 line is used as a set-up selector. The "CAN 2-L" (terminal 7) must be connected to "CAN 2 GND" (terminal 8) via an external switch and through a 10 k resistor.

When the switch is closed, the indicator is put into set-up mode and the time the switch is closed is used to select the different settings. The time the switch is opened again is used to select and store new values.

Protection of set-up:

- Set-up switch/input must not be "closed" the first 30 seconds after power-up. If it is "closed", the calibration function will be inhibited until new power-up without "closed" calibration input.
- Calibration will not react to any input "Close" < 5 seconds (closed 5 seconds without any interruption)
- If the input is "closed" for >20 seconds, the calibration sequence is terminated without storing any change and a new sequence can first be started after an input "open" for at least 5 seconds.

The above should prevent an accidental short-circuit either a short glitch (a wire hitting the terminal) or continuous short-circuit to change any setting.

Caution

Power supply to the XL indicators must be stable and must not be interrupted during the set-up process. Lost power during this process may cause incorrect set-up and a new set-up process must be performed.

Synchronisation of other XL indicators on the CAN1 bus

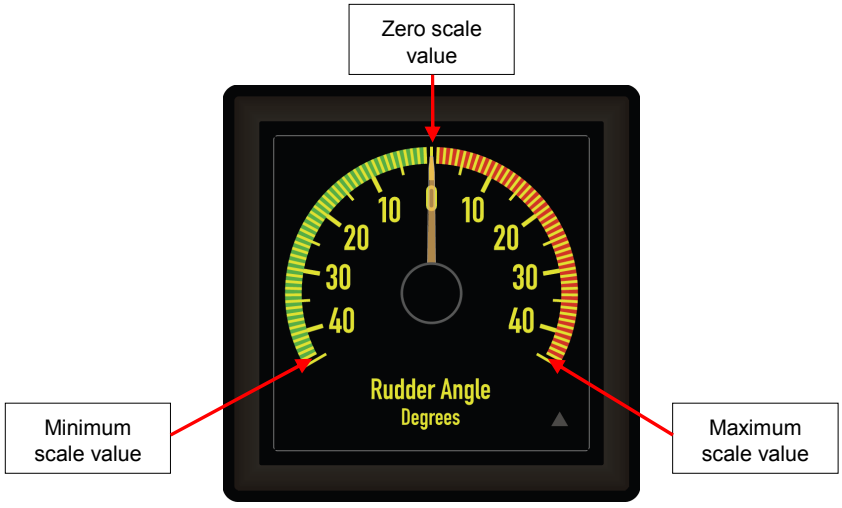
XL indicators using the same CAN-ID (that is listening for data coming from this CAN ID) will automatically be synchronised with the XL where the set-up process is performed.

Replacing an XL indicator in a calibrated system

If an XL indicator is replaced in a system, the system has to be set up again!

Set-up procedure for indicators with scales <360º (e.g. RPM, Pitch, Rudder)

The indicator scale will be considered as two linear sections, respectively minimum to zero and zero to maximum.



Step 1: Zero set

The sensor/input must be positioned at desired zero value and on the indicator, the set-up switch must be closed:

- After 5 seconds, the indicator pointer will move to 0 degree (just check, no action)
- Between 5 and 10 seconds, the new zero scale value is stored when set-up switch is opened (the LED will flash once for verification)
  (When controlled by a processor, a switch close time of 5.5 to 9.5 sec must be used).

If no new value was stored (switch still closed), wait until >20 seconds. Then the calibration sequence will be terminated without storing a new setting and the indicator pointer will move back to the scale position given by the present sensor/input value (normal mode).

Step 2: Minimum value set

The sensor/input must be positioned at desired minimum value and on the indicator, the set-up switch must be closed:

- After 5 seconds, the indicator pointer will move to scale zero (just check, no action)
- After 10 seconds, it will move to maximum scale value (check, no action)
- After 15 seconds, it will move to minimum scale value (check, no action)
- Between 10 and 15 seconds, the new maximum scale value is stored when set-up switch is opened (the LED will flash once for verification)
  (When controlled by a processor, a switch close time of 15.5 to19.5 seconds must be used).

If no new value was stored (switch still closed), wait until >20 seconds. Then the calibration sequence will be terminated without storing a new setting and the indicator pointer will move back to the scale position given by the present sensor/input value (normal mode).

Step 3: Maximum value set

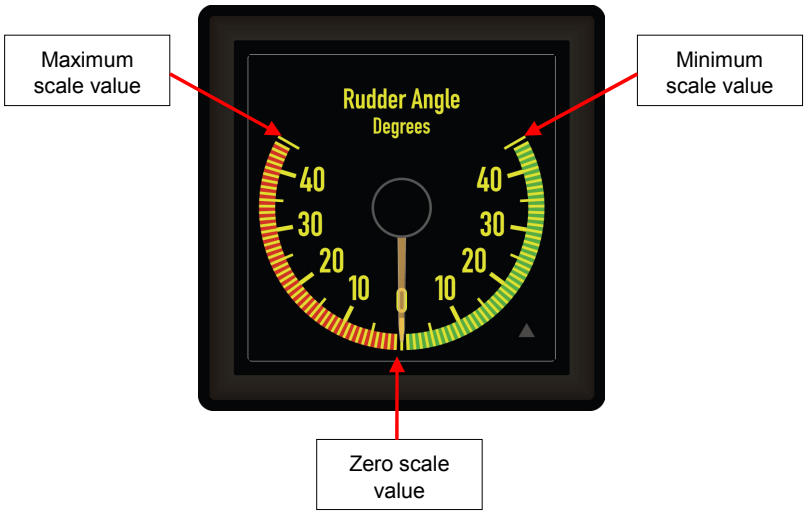
The sensor/input must be positioned at desired maximum value and on the indicator, the set-up switch must be closed:

- After 5 seconds, the indicator pointer will move to scale zero (just check, no action)
- After 10 seconds, it will move to maximum scale value (check, no action)
- Between 10 and 15 seconds, the new maximum scale value is stored when set-up switch is opened (the LED will flash once for verification)
  (When controlled by a processor, a switch close time of 10.5 to 14.5 seconds must be used).

If no new value was stored (switch still closed), wait until >20 seconds. Then the calibration sequence will be terminated without storing a new setting and the indicator pointer will move back to the scale position given by the present sensor/input value (normal mode).

Changing pointer rotation:

If it is necessary to change the pointer rotation from the default CW to CCW, this can be done by placing the input/sensor maximum value at scale minimum and the input/sensor minimum value at scale maximum.



This could be relevant on e.g. rudder indicators where the pointer is "hanging" as shown above, and in systems (same sensor) where they are used together with the "standing" pointer as shown previously.

On both indicators, the shown rudder angle 45 degree port side (red) is set-up as maximum value. This will give the "standing" type CW pointer rotation and the "hanging" CCW pointer rotation.

Set-up procedure for indicators with scales = 360º (Azimuth)

Step 1: Zero set

The sensor/input must be positioned at desired zero value and on the indicator, the set-up switch must be closed:

- After 5 seconds, the indicator pointer will move to 0 degree (just check, no action)
- Between 5 and 10 seconds, the new zero scale value is stored when set-up switch is opened (the LED will flash once for verification)
  (When controlled by a processor, a switch close time of 5.5 to 9.5 sec must be used).

If no new value was stored (switch still closed), wait until >20 seconds. Then the calibration sequence will be terminated without storing a new setting and the indicator pointer will move back to the scale position given by the present sensor/input value (normal mode).

Step 2: Pointer CCW rotation set

On the indicator, the set-up switch must be closed:

- After 5 seconds, the indicator pointer will move to scale zero (just check, no action)
- After 10 seconds, the pointer will present input values as CCW
- Between 10 and 15 seconds, CCW rotation value is stored when set-up switch is opened (the LED will flash once for verification)
  (When controlled by a processor, a switch close time of 10.5 to 14.5 seconds must be used).

If no new value was stored (switch still closed), wait until >20 seconds. Then the calibration sequence will be terminated without storing a new setting and the indicator pointer will move back to the scale position given by the present sensor/input value (normal mode).

Step 3: Pointer CW rotation set (default setting)

On the indicator, the set-up switch must be closed:

- After 5 seconds, the indicator pointer will move to scale zero (just check, no action)
- After 10 seconds, the pointer will present input values as CCW
- After 15 seconds, the pointer will present input values as CW
- Between 15 and 20 seconds, CW rotation value is stored when set-up switch is opened (the LED will flash once for verification)
  (When controlled by a processor, a switch close time of 15.5 to 19.5 seconds must be used).

If no new value was stored (switch still closed), wait until >20 seconds. Then the calibration sequence will be terminated without storing a new setting and the indicator pointer will move back to the scale position given by the present sensor/input value (normal mode).

Single and Dual CANopen version

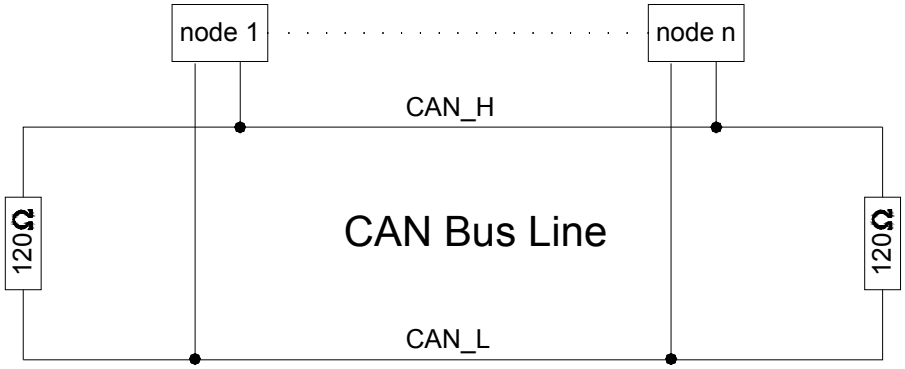
After power-up the LED is flashing once every second, and after two seconds the LED is turned off.

If the LED keeps flashing, there is no communication over both CANopen lines. If the microprocessor stops, the heartbeat signal on the CANbus is interrupted and the error LED keeps flashing.

The default setup of the CANopen is Baud rate 125 kbit/s, alternatively the Baud rate can be changed to 250 kbit/s. For further information regarding the CAN communication, please see the CAN specification manual at www.deif.com.

Termination of the CANopen line

To accomplish safe communication over the CANopen line, termination of the cable is very important (see the drawing below). The applied cable must be of the type twisted pair with screen, e.g. 2x2x0, 50 mm^2, e.g. LIYCY-P from Solar. The maximum length at Baud rate 125 kbit/s is 500 m, and 250 m at Baud rate 250 kbit/s.

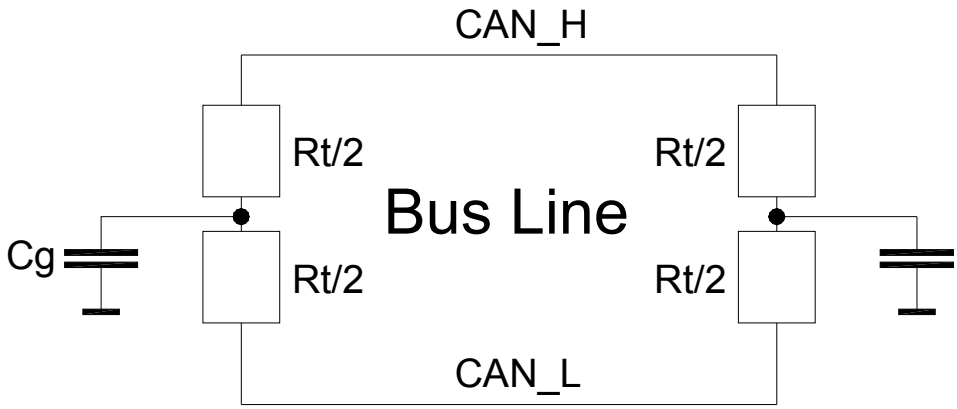


The cable screen must never be connected to earth.

In case the communication is interrupted because of noise, connect the cable screen to terminal 5 and also 8, if dual CAN is used, on all instruments in the loop.

It is recommended that the two cable screens for CAN 1 and CAN 2 are not connected.

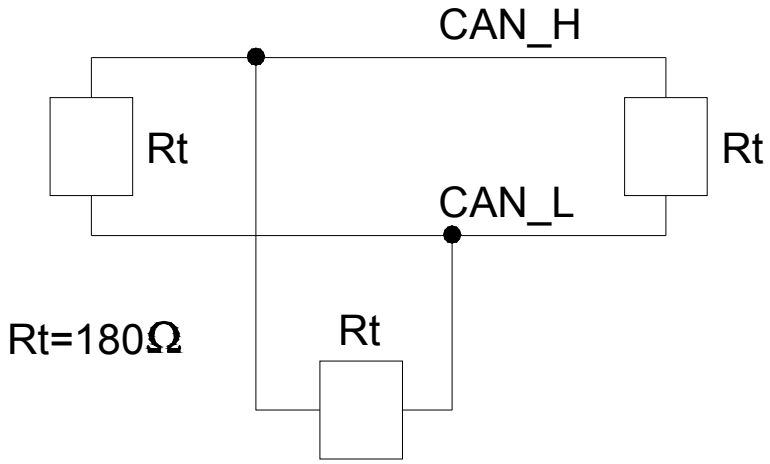
If the environment is very noisy (electrical noise), the below-mentioned arrangement can be used for enhanced EMC characteristics.



Rt/2 = 60 Ohm, Cg = 10…100nF
The capacitor should be connected to a "quiet" ground level, e.g. the screen of the used cable, that is then connected to the GND input on each illuminator.

The capacitor must never be connected to any other ground, e.g. the earth or the hull of the ship.

The example below shows how a CAN line different from a single line structure can be arranged. In the example a star topology with three branches is shown. To accommodate such a topology, the multiple termination concepts may be considered. Note the value of the used termination resistors.



Error handling

Analogue 240 degree types

Indicator status	Error Δ LED	Pointer	Remark
Power-up	Flashes two or three times	Random, then moving to actual value or error position	Pointer moves uncontrollably for a few seconds, this is normal operation
Input within range	OFF	Actual reading	Normal state
Input out of range	OFF Flashes twice when re-entering normal state	In error position 2-3 degrees outside scale arc in relevant side	Pointer stops at scale max./min. for two seconds and moves to error position
Power-down (power off)	OFF	Moves to random position (not locked)	External PSU supervision is recommended
Internal error (watch dog)	Continuous flashing	Random	Unit must be returned to DEIF for service!

Analogue 360 degree types

Indicator status	Error Δ LED	Pointer	Remark
Power-up	Flashes two or three times	Random, then moving to actual value or error position	Pointer moves uncontrollably for a few seconds, this is normal operation
Input within range	OFF	Actual reading	Normal state
Input out of range	Continuous flashing	Random, typically last valid reading	As no pointer position can be used as error, LED is flashing instead
Power-down (power off)	OFF	Moves to random position (not locked)	External PSU supervision is recommended
Internal error (watch dog)	Continuous flashing	Random	Unit must be returned to DEIF for service!

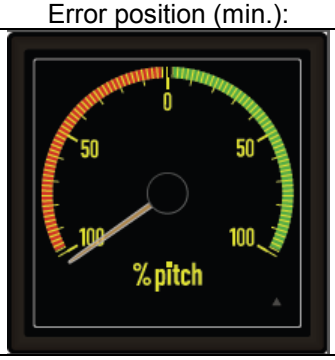
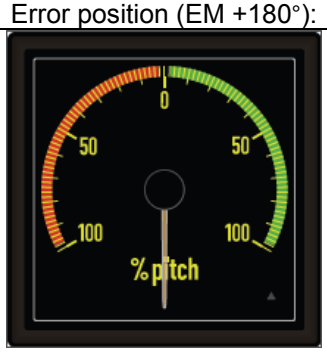
CAN 240 degree types

Indicator status	Error ∆ LED	Pointer	Remark
Power-up	Flashes two or three times	Random, then moving to actual value or error position	Pointer moves uncontrollably for a few seconds, this is normal operation
Input within range	OFF	Actual reading	Normal state
Input out of range	OFF Flashes twice when re-entering normal state	In error position 5 degrees outside scale arc in relevant side	Pointer stops at scale max./min. for two seconds and moves to error position
Missing CAN	Continuous flashing	Moves to error position EM +180°	
Power-down (power off)	OFF	Moves to random position (not locked)	External PSU supervision is recommended
Internal error (watch dog)	Continuous flashing	Random	Recheck that this is not a CAN error! Unit must be returned to DEIF for service!

CAN 360 degree types

Indicator status	Error ∆ LED	Pointer	Remark
Power-up	Flashes two or three times	Random, then moving to actual value or error position	Pointer moves uncontrollably for a few seconds, this is normal operation
Input within range	OFF	Actual reading	Normal state
Input out of range	Flashing	Random, typically last valid reading	As no pointer position can be used as error, LED is flashing instead
Missing CAN	Continuous flashing	Moves to error position EM +180°	Error position is also valid reading
Power-down (power off)	OFF	Moves to random position (not locked)	External PSU supervision is recommended
Internal error (watch dog)	Continuous flashing	Random	Recheck that this is not a CAN error! Unit must be returned to DEIF for service!

Pointer positions for illustration

Error position (min.):	Error position (max.):	Error position (EM +180°):
		
Minimum value (4 mA):	EM (electrical mid, 12 mA):	Maximum value (20 mA):
		

Note: Values shown are for a 4 to 20 mA CW indicator.

CW (clockwise, is defined as pointer moving CW with increasing positive input).

DEIF A/S reserves the right to change any of the above.