

## ARISO M30 General GPIO Contactless Coupler Pair



### 1. PRODUCT PART NUMBERS, MARKING AND LABELING

#### 1.1 Product marking and labeling

- Product name ARISO 12 Watt
- Identification number TXM030S012PNP2A / RXM030S012PNP2A
  - Tx / Rx Transmitter / Receiver
  - M Form factor, M = Circular
  - 030 Diameter
  - S Product type, S = Standard
  - 012 Power level, 12W
  - PNP Data type, PnP variant
  - 2/8 Number of PNP channels
  - a/b Coding option

#### 1.2 Part number

- 2287598-1: ARISO TXM030S012PNP2A
- 2287598-3: ARISO TXM030S012PNP8A
- 2287598-2: ARISO RXM030S012PNP2A
- 2247598-4: ARISO RXM030S012PNP8A
- 2247598-5: ARISO RXM030S012PNP8B

## 2. GENERAL

### 2.1 Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable customer product drawing (C-2287598) and product specification (108-19484).

The following variants are available.

- M30, 4 pos variant, 2 PNP Channels:
  - ARISO TXM030S012PNP2A M30 Power Transmitter / Data Receiver.
  - ARISO RXM030S012PNP2A M30 Power Receiver / Data Transmitter.
- M30, 12 pos variants, 8 PNP Channels
  - ARISO TXM030S012PNP8A Power Transmitter / Data Receiver.
  - ARISO RXM030S012PNP8A Power Receiver / Data Transmitter.  
Optimized for connection to distribution boxes 2273161-1 (S1 only), 273146-1, 2273139-1 and 2273134-1.
  - ARISO RXM030S012PNP8B Power Receiver / Data Transmitter.  
Optimized for connection to distribution box 2273161-1 (S2 supported at sockets 1 and 2, sockets 7 and 8 not connected).

### 2.2 Features

The product has the following features:

- **Power input reverse polarity protection:**  
The product switches off in case the power connected to the Tx has wrong polarity.
- **Power output short circuit protection/ Data output short circuit protection:**  
The product switches off the power / data in case the outputs are short circuited or in case the load is above specification.
- **Data input / output reverse polarity protection:**  
The product is protected against reversed connections of the data inputs and data outputs.
- **Over-temperature protection:**  
The product switches off in case the temperature becomes too high.
- **Foreign Object Protection:**  
The product switches off in case metal is put in between the power transmitter and power receiver.
- **Dynamic Pairing:**  
The ARISO Couplers are interchangeable.
- **Status OK/ In operating range Indication:**  
The ARISO Tx has two status signals indicating either normal operation or incorrect behavior (like over-temperature or the presence of a foreign object), see section 5.

### 2.3 Characteristics overview

- |                                     |   |
|-------------------------------------|---|
| • Rated input voltage Tx            | 24V <sub>DC</sub>   |
| • Rated output voltage Rx           | 24V <sub>DC</sub>   |
| • Power Transfer capability         | 12.0W @ Rx side, -20 to +55 °C ambient temperature, maximum 7.0 mm distance between Tx and Rx           |
| • Operating ambient temperature     | -20°C to 55°C   |
| • Ingress Protection                | IP67  |
| • Dimensions Tx                     | M30 x 80  |
| • Dimensions Rx                     | M30 x 80  |
| • Number of Digital GPIO Link "PNP" | 2287598-1 / -3: 2 PNP Channels Digital GPIO Link,<br>2287598-2/ -4/-5: 8 PNP Channels Digital GPIO Link |
| • Freedom of rotation               | no performance degradation of power and data up to 1250 rpm   |

## 2.4 Mechanical Data

See customer drawings C-2287598 for full details.

Parameter	Value	Units	Tolerance	Conditions
Diameter	30	mm		M30 x 1.5, See figure 1-4
Length of PTx	80	mm	Excl. cable	See figure 1, 3
Length of PRx	80	mm	Excl. cable	See figure 2, 4
Thread	M30 x 1.5			
Max. Tightening Torque	40	Nm		
Max. Cable Pull	50	N		1 minute.
Maximum weight	150	gr		Tx, including cable
	150	gr		Rx, including cable
Cable length	30	cm		
Housing Material	Nickel plated Brass			
Front-cap Material	LCP			

### TXM030S012PNP2A

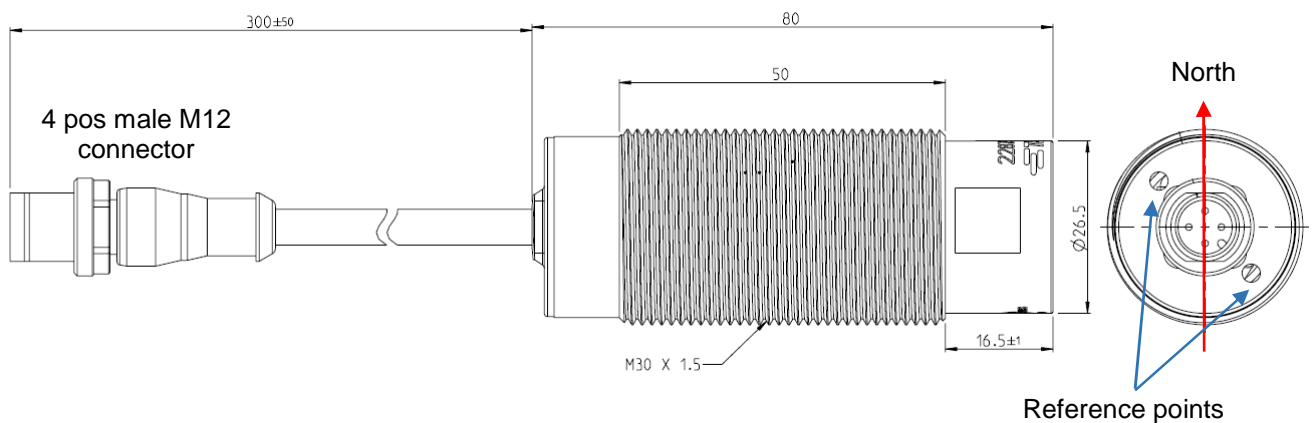


Figure 1: TXM030S012PNP2A Coupler envelope dimensions (+ definition of North axis)

### RXM030S012PNP2A

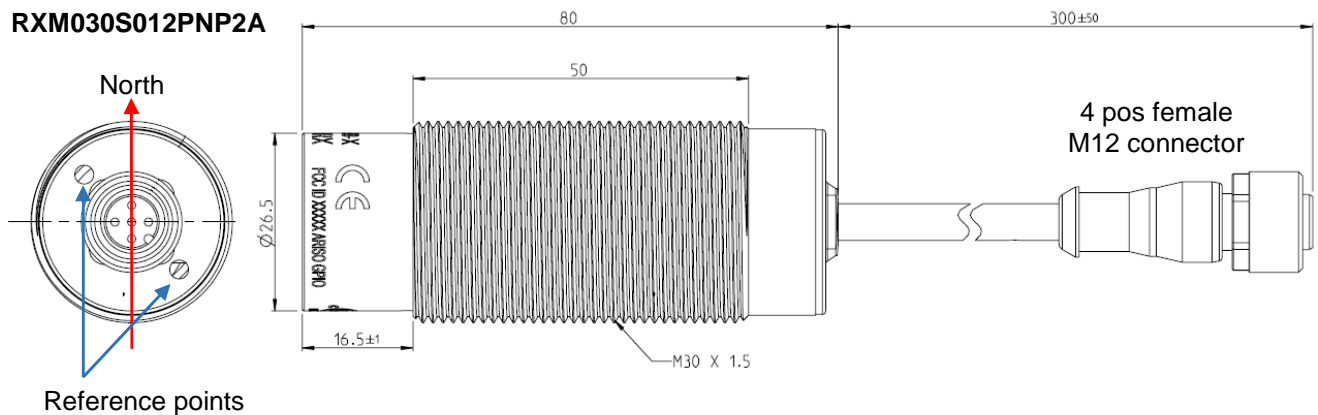


Figure 2: RXM030S012PNP2A Coupler envelope dimensions (+ definition of North axis)

### TXM030S012PNP8A

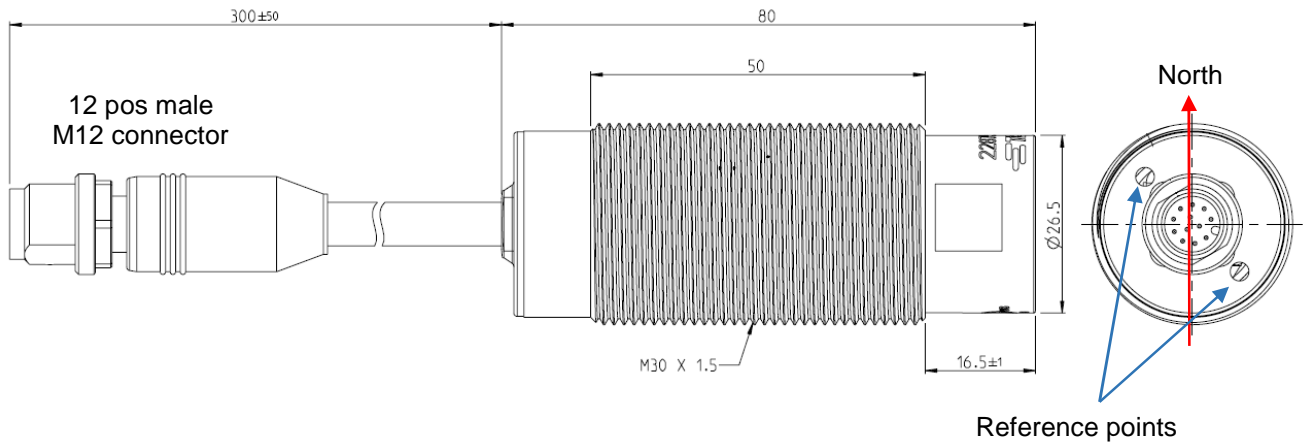


Figure 3: TXM030S012PNP8A Coupler envelope dimensions (+ definition of North axis)

### RXM030S012PNP8A/B

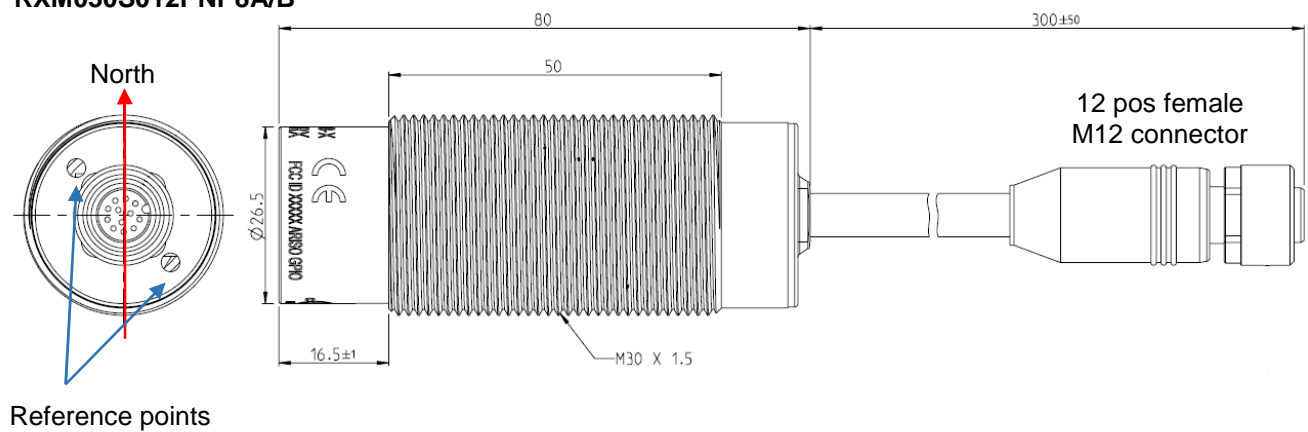


Figure 4: RXM030S012PNP8A/B Coupler envelope dimensions (+ definition of North axis)

## 2.5 Environmental Data

Parameter	Value	Units	Tolerance	Conditions
Min. ambient temperature	-20	°C		Operational
Max. ambient temperature	+55	°C		Operational
OTP Threshold	+65	°C		
Max. ambient temperature	+75	°C		Powered, non-operational
Max. ambient storage temperature	+100	°C		
Ingress Protection	IP67			
Mechanical shock	30g	m/s <sup>2</sup>		IEC 60512-6-3
Mechanical vibration	0.01	G <sup>2</sup> /Hz		IEC 60512-6-4
Free fall test	1	m		IEC 60512-6-5
Rapid temperature change	-20 to +80	°C		IEC 60512-11-4
Damp heat, cyclic	21 cycles			IEC 60512-11-12 lower air 25 °C, 90-100% RH higher air 55 °C, 90-100% RH Cycle duration 12+12 hrs.
Dry heat	+80	°C		IEC 60512-11-9
Flowing mixed gas corrosion				IEC 60512-11-7
Electrostatic discharge	8 / 4	kV		Air / Contact IEC 61000-4-2, crit. B
Radiated EM field immunity	10	V/m		IEC 61000-4-3, 80-1000 MHz
Fast transient immunity	±1 / ±2	kV		Data / Supply IEC 61000-4-4
Surge immunity	±2	kV		Supply lines to ground, crit. B.
Immunity to conducted disturbances	10	Vrms		IEC 61000-4-6
Power frequency magnetic field immunity	30	A/m		IEC 61000-4-8, crit. A
EMC				According IEC61000-6-4 Emission According IEC61000-6-2 Immunity According CISPR-11 / EN55011, Class A
Compliance	CE, UL, FCC, MIC			

### 3. POWER LINK

#### 3.1 Power Input

Parameter	Value	Units	Tolerance	Conditions
Input voltage	24.0	Vdc	+/- 10%	
Maximum standby power	1.0	W		Unmated
	4.0	W		Mated
Maximum input current	0.75	A		
Maximum inrush current	1.4	A		
Reverse Polarity Protection	Yes			
Foreign Object Protection	Yes			See 3.2.6
Under-Voltage Lockout	20.3	V		
UVL hysteresis	0.1	V		

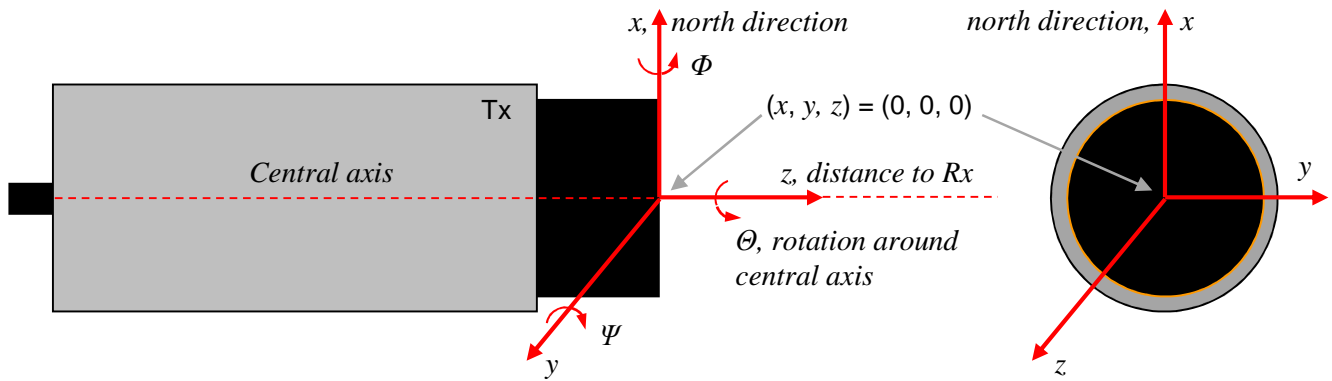
#### 3.2 Power Output

##### 3.2.1 General

Parameter	Value	Units	Tolerance	Conditions
Output voltage	24.0	Vdc	+/- 5%	
Continuous output power	12.0	W		Max 7.0 mm distance
Peak output power	12.5	W		No misalignment
Max. output ripple & noise	480	mV		
Operational readiness	160  10	ms  ms		Rx Power and Data ready at full load when Tx is switched on.  Tx Data ready after Rx power ready. Please also take the startup time of the sensor into account
Short circuit protection	Yes			
Output inrush current handling capability	200	μAs		2 A during 100 μs, 10A during 20 μs
Output short circuit current	0.65	A		
Over-temperature protection	Yes			
Maximum distance	7	mm		See 3.2.3
Maximum misalignment	5	mm		At 4 mm, see 3.2.2
Maximum tilt	30	°		At 7 mm, see 3.2.2
Rotational invariance	1250*	RPM		See 3.2.6 *
Minimum inter coupler distance	60	mm		See 3.2.5
Minimum metal clearance in x-y direction	15	mm		See 3.2.7 (measured to Copper)
Minimum metal clearance in z direction	10	mm		See 3.2.7 (measured to Copper)

\* Tested at another version

### 3.2.2 Coordinate and misalignment definitions



**Figure 5: Coordinate definitions**

The point  $(x, y, z) = (0, 0, 0)$  coincides with the front midpoint of the Power Transmitter device (Tx). The definition of  $\Theta = 0$  is given by coinciding North “directions” of the Rx and Tx.

The  $\Phi$ ,  $\Psi$ , and  $\Theta$  define respectively the rotation angle around the x, y, and z axis.  $(\Phi, \Psi) = (0, 0)$  means that the symmetry axes of Transmitter and Receiver coincides. As the setup has a cylindrical symmetry, there is basically no difference between the angles  $\Phi$  and  $\Psi$ . The angle  $\Omega$  refers to either  $\Phi$  or  $\Psi$  or a combination of the two.

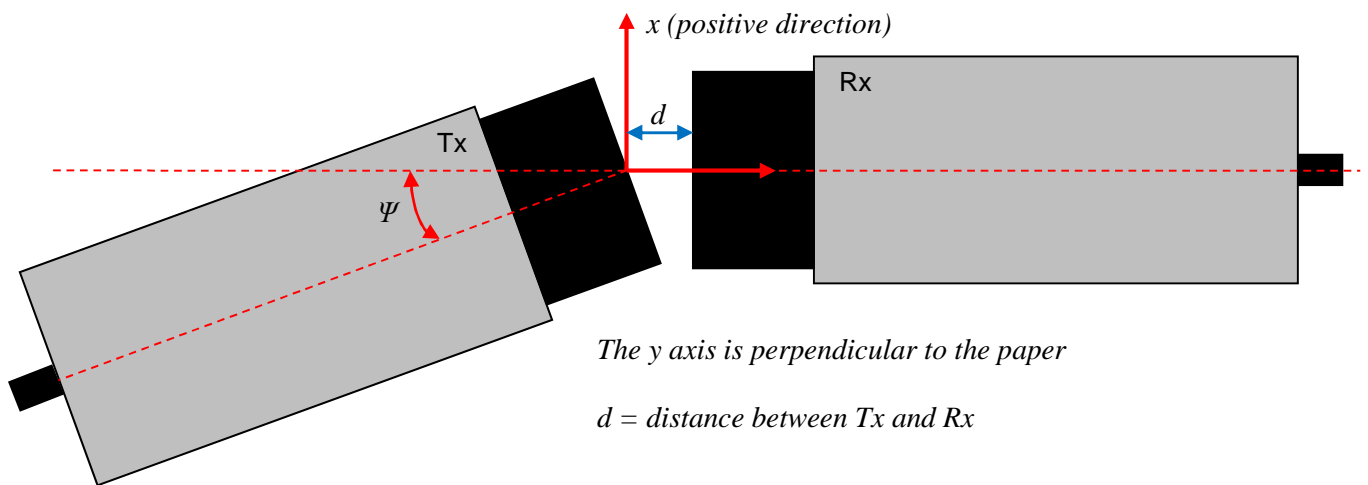
$\Delta x$  defines the misalignment in vertical direction;  $\Delta y$  defines the misalignment in horizontal direction. The point  $(x, y, z) = (0, 0, 0)$  coincides with the front midpoint of the Power Transmitter device (Tx). The radial distance  $r$  gives the misalignment:  $\Delta r (= \sqrt{\Delta x^2 + \Delta y^2})$ .

$\Delta z = d$  defines the distance between the midpoint of the front surface of the Transmitter and the midpoint of the front surface of the Receiver (“mating distance”).

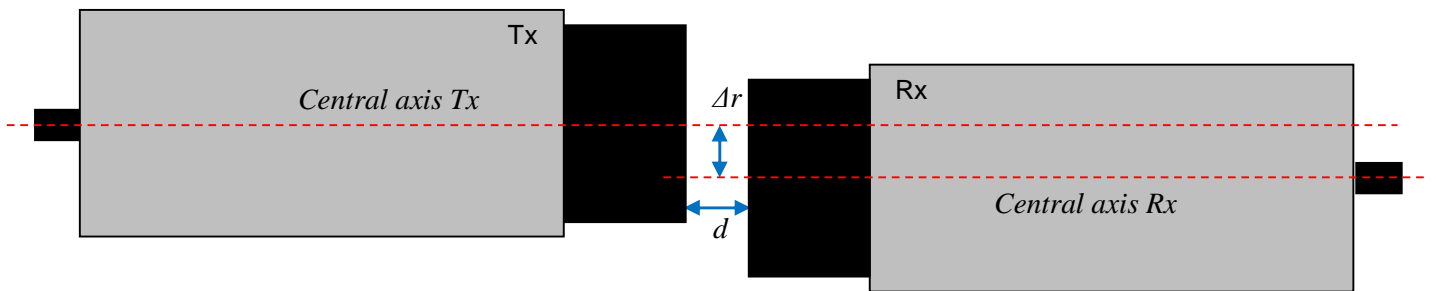
When  $(\Delta x, \Delta y) \neq (0, 0)$  or  $\Delta r \neq 0$ , there is displacement misalignment.

When  $(\Delta \Phi, \Delta \Psi) \neq (0, 0)$  or  $\Delta \Omega \neq 0$ , there is tilt misalignment.

There is no misalignment is  $(\Delta x, \Delta y) = (0, 0)$  and  $(\Delta \Phi, \Delta \Psi) = (0, 0)$ .



**Figure 6: Definition of tilt angle  $\Psi$**


Figure 7: Definition of misalignment  $\Delta r$ 

### 3.2.3 Maximum Power over Distance

Distance (mm, cap-to-cap between Rx and Tx)	Output Power (W)	Remarks
0.0	12.0	See 3.2.2
2.0	12.0	
4.0	12.0	
6.0	12.0	
7.0	12.0	
8.0	1.0	

### 3.2.4 Maximum Power over Misalignment

Distance / Misalignment / Tilt : $\Delta z$ mm $\Delta r$ mm $\Delta \Omega$ °	Output Power (W)	Remarks
0.0 ±5.0 0.0	12.0	See 3.2.2
2.0 ±5.0 0.0	12.0	
2.0 0.0 7.5	12.0	
2.0 ±5.0 8.5	12.0	
4.0 ±5.0 0.0	12.0	
4.0 0.0 15.0	12.0	
4.0 ±5.0 17.5	12.0	
5.0 ±3.0 0.0	12.0	
5.0 0.0 20.0	12.0	
5.0 ±3.0 22.5	12.0	
7.0 ±2.0 0.0	12.0	
7.0 0.0 25	12.0	
7.0 ±2.0 32.5	12.0	
8.0 ±1.0 0.0	1.0	
8.0 0.0 30.0	1.0	
8.0 ±1.0 38.0	1.0	



### 3.2.5 Inter Coupler Distance

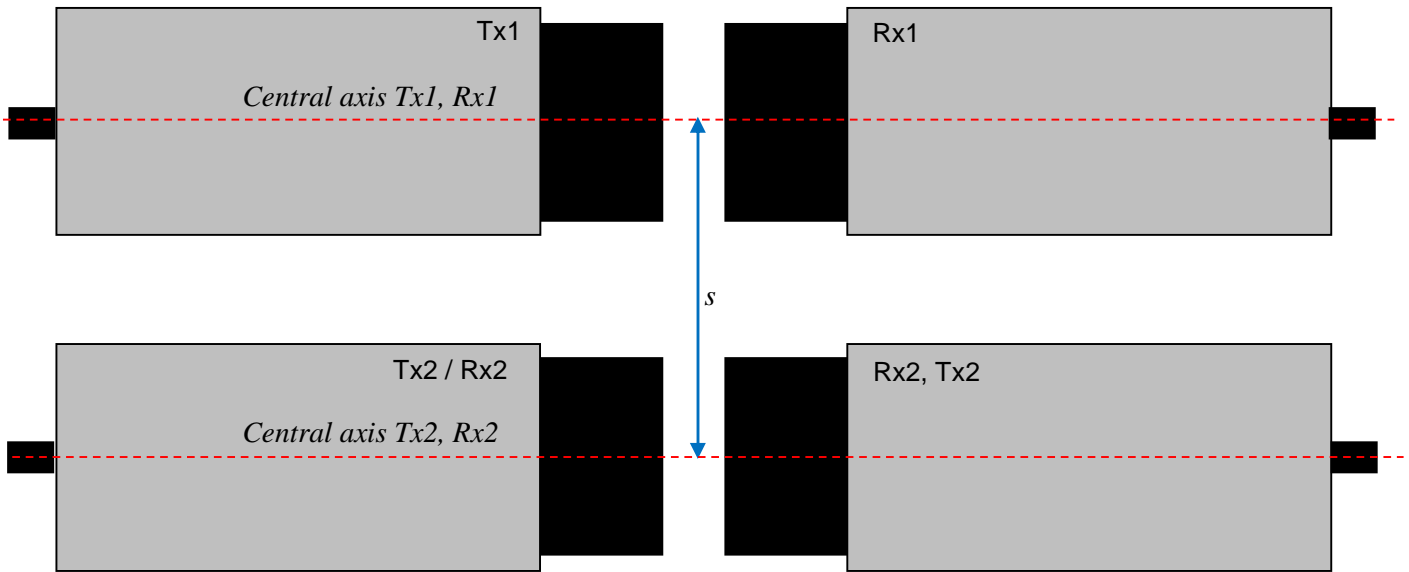


Figure 8: Definition of Inter Coupler Distance  $s$

### 3.2.6 Rotational freedom of couplers

Rotational freedom is defined as performance independency of couplers from their rotation to each other along their length axis. Couplers have been tested with a RPM of max. 1250 (rotation per minute) for an hour. No performance degradation were observed during the test phase.

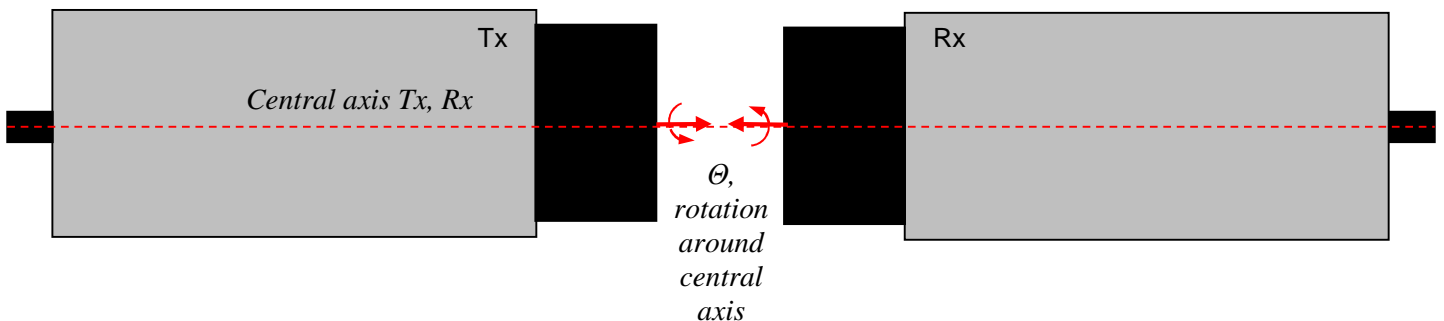


Figure 9: Definition of Rotational Freedom

### 3.2.7 Foreign Object Protection

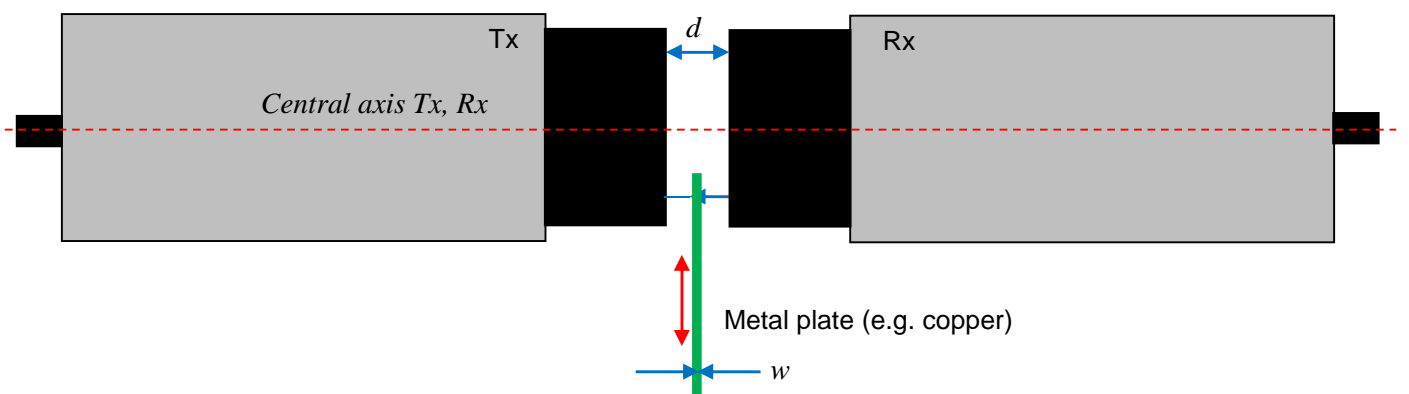
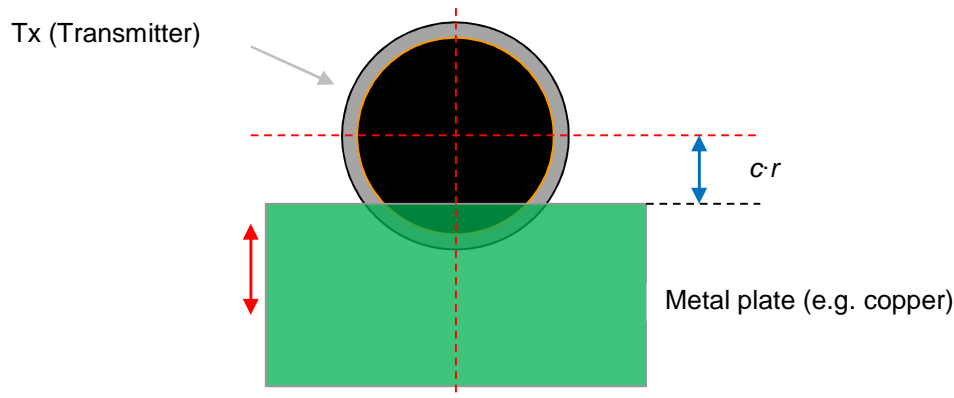


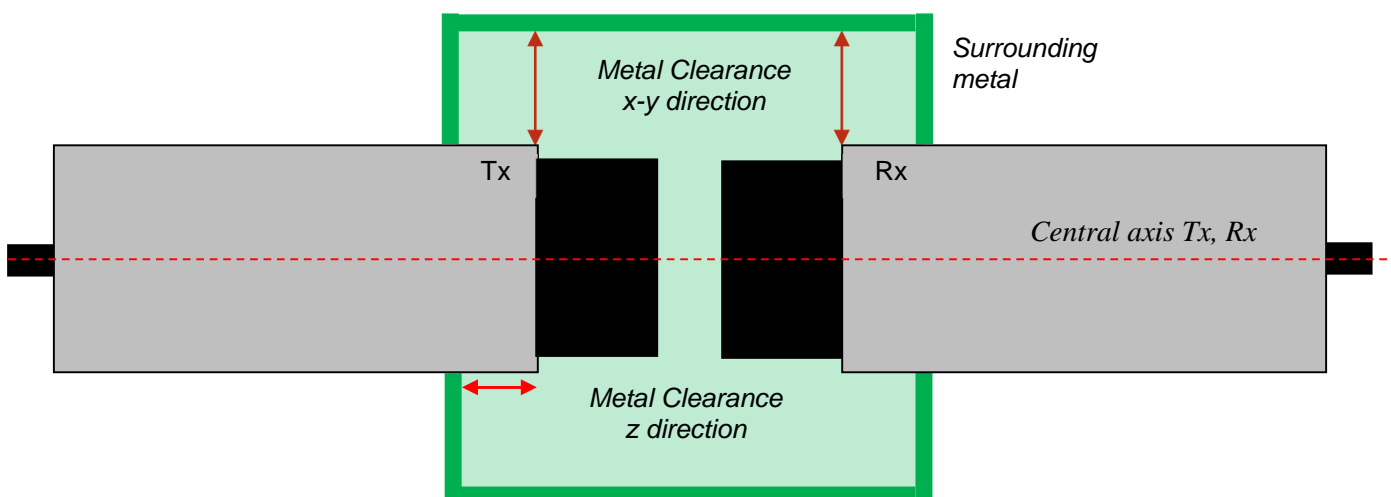
Figure 10: Definition of Foreign Object Protection (1)



**Figure 11: Definition of Foreign Object Protection (2)**

The Foreign Object Protection is defined as the percentage of the coupler Front-End area covered by metal. The power transmitter Tx will switch off if the front end area of the Tx is covered for more than 40% by electrically conducting material such as metal.

### 3.2.8 Metal Clearance



**Figure 12: Definition of Metal Clearance**

The metal clearance is the shortest distance between any part of the metal housing / plastic front-end and surrounding metal. Note that there is a difference between the metal clearance in the x-y direction and the metal clearance in the z direction.

## 4. DATA LINK

### 4.1 GPI, General Purpose Digital Inputs (PNP) at Rx side

Parameter	Value	Units	Tolerance	Conditions
Maximum Input Voltage	36	V		
Minimum Input Voltage	-1	V		
Minimum Input High Level	8	V		
Maximum Input Low Level	5	V		
Input Load current	< 4.5	mA		
Maximum switching frequency	500	Hz		Single channel.

## 4.2 GPO, General Purpose Digital Output (PNP) at Tx side

Parameter	Value	Units	Tolerance	Conditions
Number of Channels	8			
Maximum Output Voltage	24	V		Equal to input voltage.
Minimum Output Voltage	0	V		
Output Stage Type	PNP			
Max. Impedance High	4	$\Omega$		
Min. Impedance Low	1M	$\Omega$		
Maximum Output Current	250	mA	+/- 20%	Overcurrent protected, see note.
Maximum Delay + Jitter	400	$\mu$ s		Single channel, see figure 10.

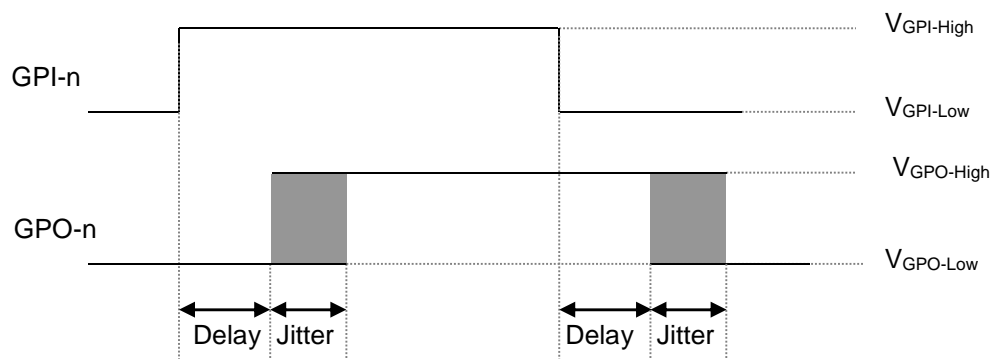


Figure 13: Definition of Delay and Jitter for GPIO digital outputs

Note: All digital outputs are over-current protected, the total sum of all currents from GPIO-1 to GPIO-8, FOD and Status\_NOK cannot be larger than specified.

## 5. IN OPERATING RANGE / STATUS INDICATION

The ARISO Transmitter (Tx) has two status signals indication the status of operation. These two signals, Status\_NOK and FOD, indicate following states:

State Description	FOD level	Status_NOK Level	Notes
Tx powered Rx unit missing	Low	High	
Tx powered Rx paired with Tx	Low	Low	System in <u>operating range</u> & normal operation
Tx powered Rx paired with Tx System error	Low	High	System error e.g.: Over temperature Rx obstructed by Foreign Object
Tx powered Rx paired with Tx Too high power by FOD	High	High	System error e.g.: Rx obstructed by Foreign Object

## 6. CONNECTOR PINNING CODING

The Transmitter (Tx) and Receiver (Rx) are equipped with a cable attached to a standard 4 or 12-pos M12 connector. For the pin definitions see figure 11 and 12. For the mechanical outline see figures 1 and 2.

## 6.1 Connector pin definitions:

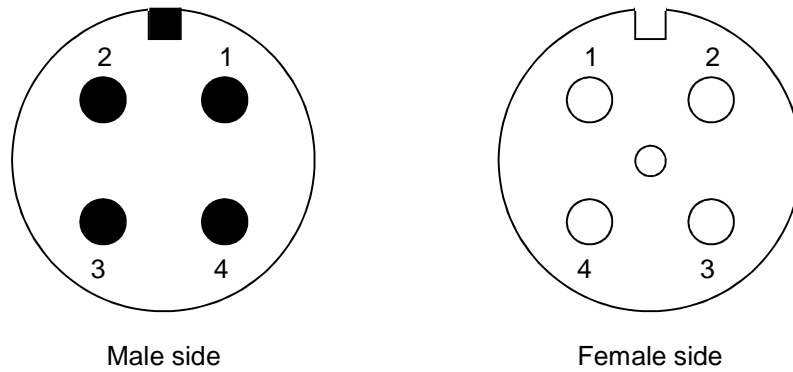


Figure 14: Pinning of 4 pins connectors (mating face view)

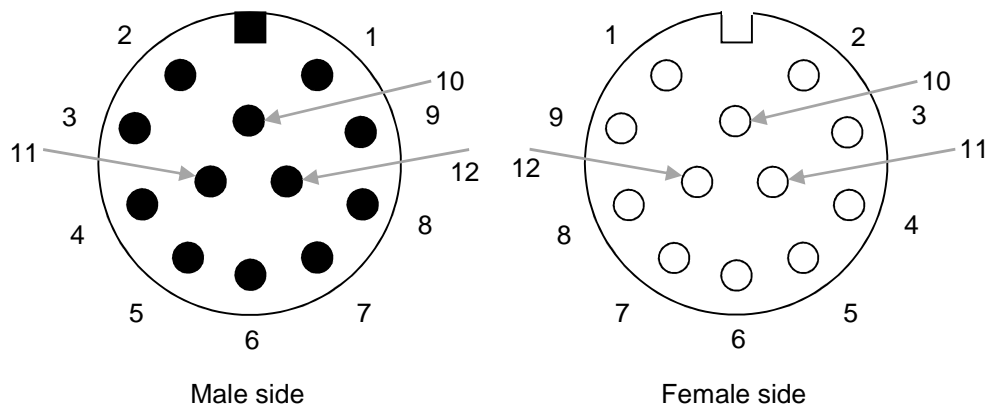


Figure 15: Pinning of 12 pins connectors (mating face view)

## 6.2 Connector Pinning Tx side

### 6.2.1 4 pos connector pinning Tx side (ARISO TXM030S012PNP2A)

Pos number	Power Transmitter (Tx) / Data Receiver
1	+24Vdc
2	GPO-1
3	Ground
4	GPO-2

**6.2.2 12 pos connector pinning Tx side (ARISO TXM030S012PNP8A)**

Pos number	Power Transmitter (Tx) / Data Receiver
1	+24Vdc
2	Ground
3	GPO-1
4	GPO-2
5	GPO-3
6	GPO-7
7	GPO-5
8	GPO-4
9	GPO-6
10	GPO-8
11	FOD
12	Status_NOK

Note:

This pinning fits to TE Connectivity distribution boxes 2273161-1, 2273146-1; 2273139-1 and 2273134-1.

**6.3 Connector Pinning Rx side****6.3.1 4 pos connector pinning Rx side (ARISO RXM030S012PNP2A)**

Pos number	Power Reciever (Tx) / Data Transmitter
1	+24Vdc
2	GPI-1
3	Ground
4	GPI-2

### 6.3.2 12 pos connector pinning Rx side, A version (ARISO RXM030S012PNP8A)

Pos number	Power Receiver (Rx) / Data Transmitter	Comment
1	+24Vdc	
2	Ground	
3	GPI-1	S1 Socket 1
4	GPI-2	S1 Socket 2
5	GPI-3	S1 Socket 5
6	GPI-4	S1 Socket 3
7	GPI-5	S1 Socket 7
8	GPI-6	S1 Socket 4
9	GPI-7	S1 Socket 6
10	GPI-8	S1 Socket 8
11	N.C.	
12	N.C.	

**Note:**

This pinning fits to TE Connectivity distribution boxes 2273146-1; 2273139-1 and 2273134-1 and to distribution box 2273161-1 (only 8xS1 of the Distribution box sockets).

### 6.3.3 12 pos connector pinning and wire color Pinning Rx side, B version (ARISO RXM030S012PNP8B)

Pos number	Power Receiver (Rx) / Data Transmitter	Comment
1	+24Vdc	
2	Ground	
3	GPI-1	S1 Socket 1
4	GPI-2	S1 Socket 2
5	GPI-3	S1 Socket 5
6	GPI-4	S1 Socket 3
7	N.C.	
8	GPI-5	S1 Socket 4
9	GPI-6	S1 Socket 6
10	N.C.	
11	GPI-7	S2 Socket 1
12	GPI-8	S2 Socket 2

**Note:**

This pinning fits to TE Connectivity distribution box 2273161-1, S2 at Sockets 1&2 supported but sockets 7&8 not working.

## 7. TE CONNECTIVITY DISTRIBUTION BOXES TO COMBINE WITH ARISO CONTACTLESS CONNECTIVITY

