

Data Sheet

Inclination position sensor
Type **DST X720**

For mobile hydraulic applications



The Danfoss DST X720 mid level Inclination sensors are developed to ensure a robust and high-performance solution for applications such as agricultural- and construction machines, as well as material handling equipments. These sensors are typically used in safety applications in order to keep the inclination of a machine, or just a part of it, a safety zone for working people, under control.

Danfoss DST X720 series uses MEMS technology for single and dual axis with measurement ranges up to 360° in both single and redundant versions.

All sensors are designed for off-highway applications and resistant to shock and vibrations and with high electromagnetic compatibility, and comes with either analogue or CANopen output.

Single and redundant sensor types are available, making the complete portfolio suitable for safetycritical applications.

Features

- MEMS technology for almost infinite sensor life time
- Single or Redundant ranges up to 360° ($\pm 180^\circ$)
- Output: Analogue or CANopen
- Electrical connector: M12, 5 pin or cable
- Accuracy $< \pm 0.5\%$ FS
- Resolution 0.01°
- IP protection IP67, IPX9K

Functions

Zero point

Available for analog single circuit versions in DST X720

XY configuration (dual axis)

Figure 1: M12 version

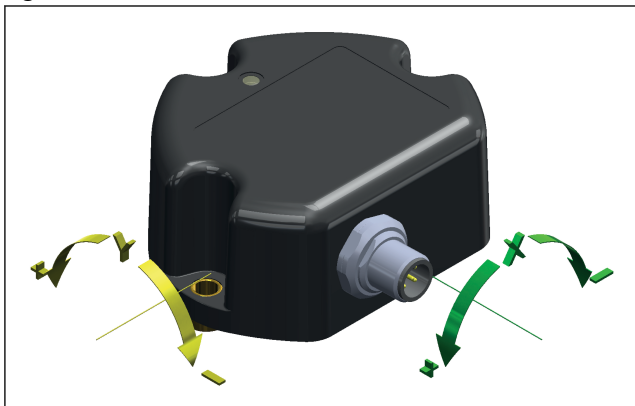
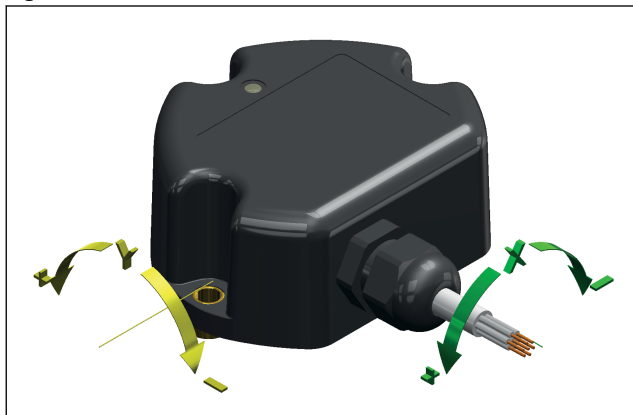


Figure 2: Cable version



To activate the Autozero function make sure that:

- sensor is powered
- fixing surface is free of dust or grease
- sensor is fixed on the horizontal plane with suitable screws

ⓘ ATTENTION:

The Autozero function can be defined within a maximum range of $\pm 4.5^\circ$ from the original zero position (factory set).

Hold the **magnetic pen** (accessory to order PKIT312) to the **ZERO POINT** indicated on the product label.

Hold the position for **at least 3-5 seconds** so that the operation is successful.

Figure 3: Magnetic pen



Product specification

Technical data

Table 1: Performance

Measuring range	$\pm 10^\circ \pm 15^\circ \pm 20^\circ \pm 30^\circ \pm 45^\circ \pm 60^\circ \pm 85^\circ$ (single axis Z / dual axis XY) $360^\circ (\pm 180^\circ)$ single axis Z
Accuracy (Factory verification @25 °C)	$\leq \pm 0.5\%$ FS
Temperature coefficient @ 0°	Typical $< \pm 0.006^\circ/\text{K}$
Long term repeatability	Single axis: Typical $< \pm 0.5^\circ$ in the range $\pm 180^\circ$ Dual axis: Typical $< \pm 0.5^\circ$ in the range $\leq \pm 60^\circ$, $\pm 2^\circ$ otherwise
Resolution	0.01° CANopen output; 12 bit analog output

Table 2: Electrical specifications

Electrical connections	M12 connector or cable
Output signal	CANopen, Ratiometric 10-90% of Vs, 0.5 - 4.5 V DC, 0-10 V DC or 4-20 mA
Supply voltage	CANopen, 0.5-4.5 V DC, 4-20 mA: 10-36 V DC, 0-10 V DC : 11-36 V DC Ratiometric: 10-90% of Vs: 5 V DC
Current consumption	Analogue: < 20 mA / pr. channel (no load) CANopen/J1939: < 15 mA /per channel (no load)
MTTFd [Years]	CANopen:631 (Single channel) Analogue: 731 (Single channel)

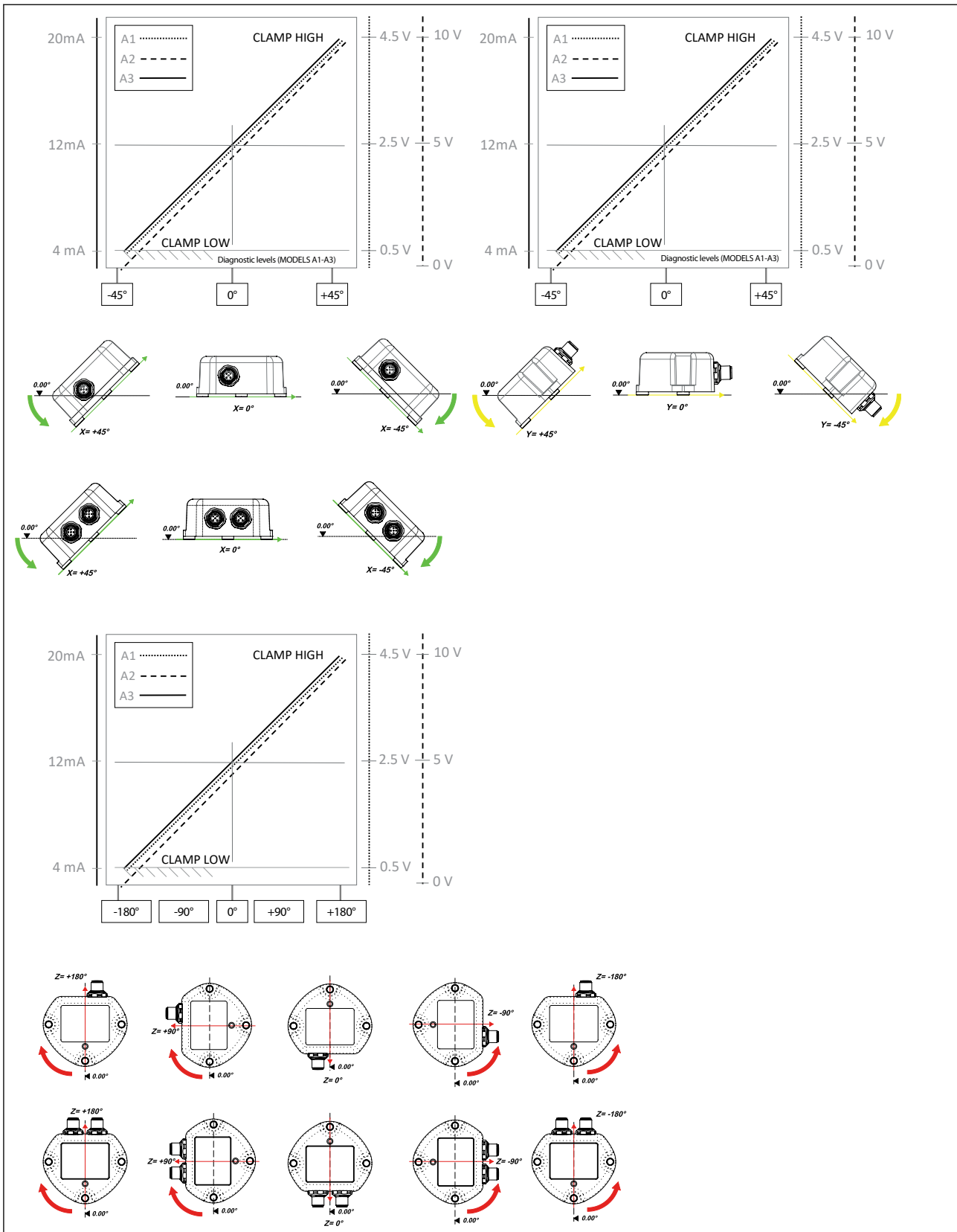
Table 3: Environmental conditions

Operating temperature range			-40 – 85 °C
EMC	Emission		EN 55011
	Immunity		EN 61236-3-2
Vibration stability	Sinusoidal	20 g, 10 Hz – 2,000 kHz	IEC 60068-2-6
Shock resistance	Impulsive on 3 axes	50 g, 11 ms	IEC 60068-2-27
IP rating			IP67, IPX9K

Table 4: Mechanical characteristics

Materials	Enclosure	PBT (Polybutylene terephthalate)
Net weight	0.26 kg (without cable)	

Output signals graphs



Load conditions

0.5 - 4.5 V DC output with power 10 - 36 V DC and 0 - 10 V DC output with power 11 - 36 V DC: apply a load resistance > 100 KΩ

Dimensions

Figure 4: M12 version

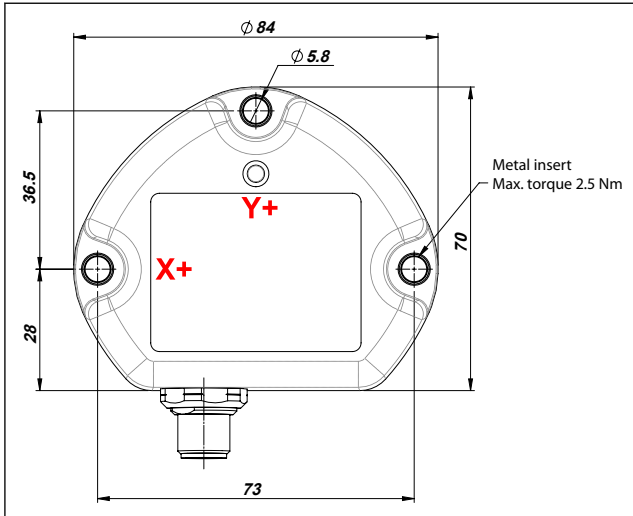
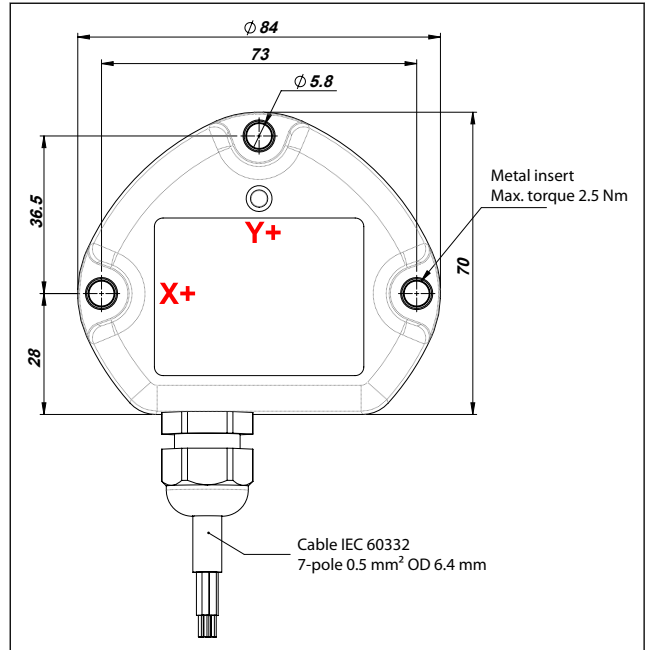
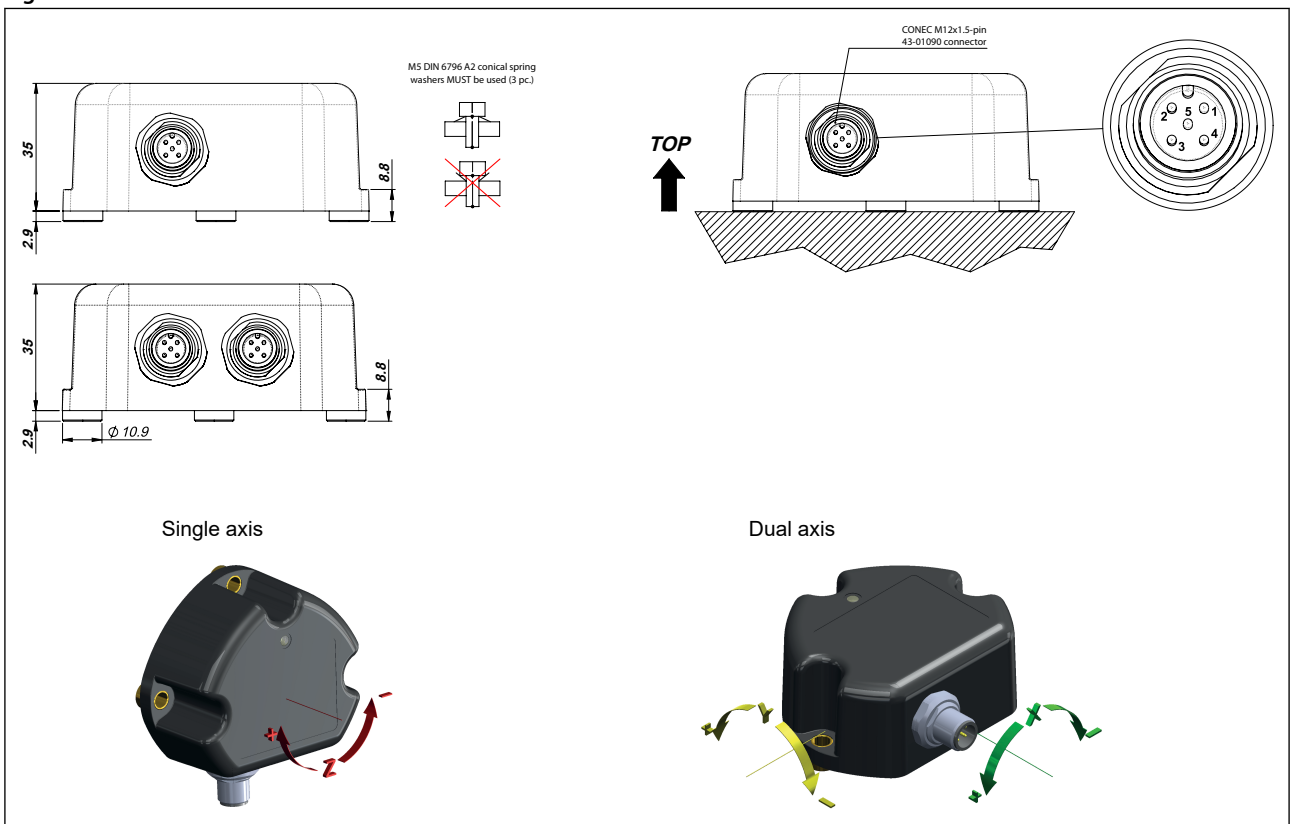


Figure 5: Cable version



Electrical connections

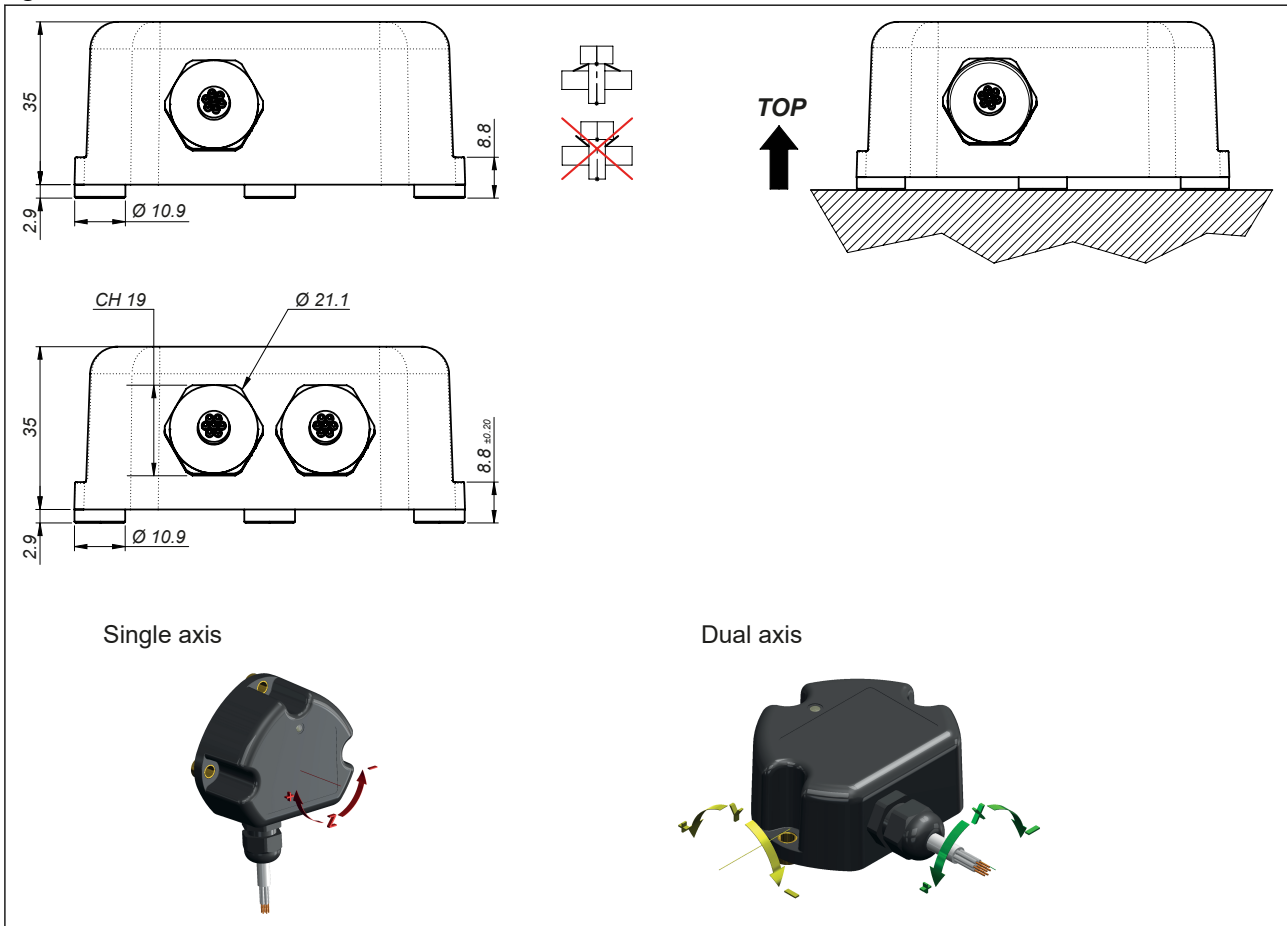
Figure 6: M12 version



Inclination position sensor, type DST X720

Connection		CAN Connection	
1	+ Supply	1	n.c.
2	Output Y	2	+ Supply
3	Ground	3	Ground
4	Output X	4	CAN H
5	n.c.	5	CAN L

Figure 7: Cable version



Connection		CAN Connection	
White	+ Supply	White	+ Supply
Yellow	Ground	Yellow	Ground
Grey	Output X	Grey	CAN H
Blue	Output Y	Blue	CAN L
Pink	n.c.	Pink	n.c.
Green	n.c.	Green	n.c.
Brown	n.c.	Brown	n.c.

Ordering

Table 5: Ordering type

Type	Output signal	Configurations	Code no.
DST X720	36 V CANopen	1 x M12 5p; Single axis; $\pm 180^\circ$; 36 V	098G3000
	36 V CANopen	2 x M12 5p; Single axis; Redundant; $\pm 180^\circ$; 36 V	098G3001
	36 V CANopen	1 x M12 5p; Dual axis; $\pm 85^\circ$; 36 V	098G3002
	36 V CANopen	2 x M12 5p; Dual axis; Redundant; $\pm 85^\circ$; 36 V	098G3003

Others on request

Ordering code - on request

Electrical connections	
M12 connector output	M
Cable output (specify cable length)	F
Axis type	
Dual axis (XY axis)	O
Single axis (Z axis)	V
Circuit type	
Single	S
Redundant	R
Output 1 Measuring range (Output for single circuit)	
Measuring range (indicate) $\pm 10^\circ \pm 15^\circ \pm 20^\circ \pm 30^\circ \pm 45^\circ \pm 60^\circ \pm 85^\circ$ (single axis Z for analogue output-dual axis XY); $360^\circ (\pm 180^\circ)$ for single Z axis only	xxx
Output 2 Measuring range (Only for redundant version)	
Measuring range (indicate) $\pm 10^\circ \pm 15^\circ \pm 20^\circ \pm 30^\circ \pm 45^\circ \pm 60^\circ \pm 85^\circ$ (single axis Z for analogue output-dual axis XY); $360^\circ (\pm 180^\circ)$ for single Z axis only	xxx
Supply voltage	
+5 V DC (only for A1 output)	L
10 - 36 V DC (see output signal for right supply voltage)	H
Output type	
0.5 - 4.5 V DC output (available with supply L = ratiometric output and with supply H = 0.5 - 4.5 V output)	A1
0 - 10 V DC output (powered at 10 - 36 V DC)	A2
4 - 20 mA output (powered at 10 - 36 V DC)	A3
CANopen output (powered at 10 - 36 V DC)	C1
Reserved	
Always	0
Certificate	
No certificate attached	0
Linearity curve to be attached	L
Version	
Standard	033
Accessories	
No accessories	X
Magnetic pen (PKIT 312)	Y
Cable length	
100 mm	01
200 mm	02
500 mm	05

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Cable length	
1 m	10
2 m	20
Other length on request	-

Table 6: Example of ordering: DST X720-MOR045045LA10 0033X00

M	M12 connector
0	Dual Axis (XY axis)
R	Redundant
045	$\pm 045^\circ$
045	$\pm 045^\circ$
L	+5 V DC
A1	Ratiometric 10 - 90% of V_s
0	M12 version
0	No certificate
033	Standard
X	No accessories
00	Not defined (only cable version)

Certificates, declarations, and approvals

The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

Some approvals may change over time. You can check the most current status at danfoss.com or contact your local Danfoss representative if you have any questions.

Table 7: Declarations

Document name	Document type	Document topic	Approval authority
098R0009	EU Declaration	EMCD/ROHS	Danfoss

Conformity

- CE
- RoHS

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