DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

DEKRA

Test report No:

NIE: 60085RAN.002A1

Assessment report
RF EXPOSURE REPORT ACCORDING TO
FCC 47 CFR Part 2.1091
ISED RSS-102 Issue 5:2015

Identification of item tested	Industrial HMI controller for weaving machine
Trademark	PICANOL
Model and /or type reference	PD15
Other identification of the product	HW version: BE322130.04 SW version: 19083.0.0.2 FCC ID: 2ATV5-PD15 IC: 25229-PD15 Contains FCC ID: XF6-RS9113SB Contains IC: 8407A-RS9113SB
Features	Wi-Fi , Bluetooth 4.0, NFC
Manufacturer	PICANOL N.V. Steverlyncklaan 15; 8900 Ieper; Belgium
Test method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. ISED RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) IEEE Std C95.3™ -2002 (R2008). IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz–300 GHz
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager
Date of issue	2019-11-07
Report template No	FAN36_01

Index

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Data provided by the client

The device under evaluation consists of an industrial HMI controller for weaving machine which supports Wi-Fi, Bluetooth and NFC 13.56 MHz.

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Identification of the client

PSICONTROL

Steverlyncklaan 15

8900 Ieper

Belgium

Document history

Report number	Date	Description
60085RAN.002	2019-09-18	First release
60085RAN.002A1	2019-11-07	Second release. Updated FCC ID and IC.

General description of the device under evaluation

The device under evaluation consists of an industrial HMI controller for weaving machine which supports Wi-Fi, Bluetooth and NFC 13.56 MHz.

According to the manufacturer, during its normal use, the separation distance between the device and the body of nearby users will be greater than 20 cm. In order to perform the assessment a conservative evaluation distance of 20 cm has been used.

The equipment specifications for each supported technologies are shown in Table 1. Values corresponding to Wi-Fi and Bluetooth technologies are declared by the manufacturer. Values corresponding to NFC have been measured and stated into DEKRA Testing and Certification, S.A.U. test report num. 60085RRF.002.

Technology / Mode	Band	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Antenna peak gain (dBi)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (mW)
Wi-Fi (802.11b/g/n)	2.4 GHz	2412 - 2484	18.00	0.99	18.99	79.25
Wi-Fi (802.11a/n)	5 GHz	4910 - 5825	18.00	4.42	22.42	174.58
Bluetooth	ISM	2402 - 2480	15.00	0.99	15.99	39.72
NFC	13.56	13.56	-	-	-34.61	0.00

Table 1: Equipment specifications

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RF Exposure Assessment result and verdict

FCC assessment:

Limits for Maximum Permissible Exposure (MPE) to comply with FCC 47 CFR § 2.1091 are defined in "§1.1310 Radiation Exposure limits, paragraph (e)":

Technology / Mode	Band	Frequency (MHz)	Distance (cm)	Power density (mW/cm²)	FCC General Population Limit (mW/cm²)	Verdict
WLAN (802.11b/g/n)	2.4 GHz	2412 - 2484	20.00	0.02	1.00	**Pass**
WLAN (802.11a)	5 GHz	4910 - 5825	20.00	0.03	1.00	**Pass**
Bluetooth	ISM	2402 - 2480	20.00	0.01	1.00	**Pass**
NFC	13.56	13.56	20.00	0.00	0.98	**Pass**

Table 2: Assessment result and verdict

Simultaneous Transmission assessment:

Simultaneous technologies and modes	Result	Limit	Verdict
WLAN 2.4 GHz + NFC 13.56	0.02	1	**Pass**
WLAN 5 GHz + NFC 13.56	0.03	1	**Pass**
Bluetooth + NFC 13.56	0.01	1	**Pass**

Table 3: Simultaneous Transmission assessment

ISED assessment:

Limits for RF Field Strength to comply with RSS-102 Issue 5 are defined in "Health Canada's RF exposure guideline, Safety code 6":

Technology / Mode	Band	Frequency (MHz)	Distance (cm)	Power density (W/m²)	ISED General Public Limit (W/m²)	Verdict
WLAN (802.11b/g/n)	2.4 GHz	2412 - 2484	20.00	0.16	5.37	**Pass**
WLAN (802.11a)	5 GHz	4910 - 5825	20.00	0.35	8.72	**Pass**
Bluetooth	ISM	2402 - 2480	20.00	0.08	5.35	**Pass**
NFC	13.56	13.56	20.00	0.00	2.00	**Pass**

Table 4: Assessment result and verdict

Simultaneous Transmission assessment:

Simultaneous technologies and modes	Result	Limit	Verdict
WLAN 2.4 GHz + NFC 13.56	0.03	1	**Pass**
WLAN 5 GHz + NFC 13.56	0.04	1	**Pass**
Bluetooth + NFC 13.56	0.01	1	**Pass**

Table 5: Simultaneous Transmission assessment

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Appendix A: FCC RF Exposure information

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FCC RF Exposure evaluation

Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile device exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When a device qualifies for the categorical exclusion provision of § 2.1091(c), the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to §1.1310 Radiofrequency radiation exposure limits, paragraph (e), the limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields are:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3–3.0	614	1.63	* 100	6
3.0–30	$1842/f$	$4.89/f$	* $900/f^2$	6
30–300	61.4	0.163	1.0	6
300–1,500			$f/300$	6
1,500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	* 100	30
1.34–30	$824/f$	$2.19/f$	* $180/f^2$	30
30–300	27.5	0.073	0.2	30
300–1,500			$f/1500$	30
1,500–100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

FCC MPE Evaluation

Each supported transmission technology will be evaluated to determine if it is in compliance with limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction:

Power density: $S[mW/cm^2] = \dfrac{P_{E.I.R.P.}[mW]}{4\Pi R[cm]^2}$

Minimum compliance distance: $R_{min}[cm] = \sqrt{\dfrac{P_{E.I.R.P.}[mW]}{4\Pi S[mW/cm^2]}}$

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

R_{min} = distance to the center of radiation of the antenna

Multiple frequencies assessment

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure toward the total exposure at a fixed location. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less than unity:

$$\sum_{i=1}^{n} \frac{S_i}{MPE_i} < 1$$

Where

S_i is the power flux density of each source;
MPE_i is the power flux density basic restriction of each source.

NFC assessment

As stated into DEKRA Testing and Certification, S.A.U. test report 60085RRF.002 the maximum measured field strength for the operating frequency is:

Frequency (MHz)	Maximum E-field strength (dBµV/m) measured at 3 m
13.56	60.62

Table 6: Measurement Results

Using Field Strength Approach formula (linear terms):

E.I.R.P = P_t x G_t = $(E \times d)^2/30$

Where:
P_t = transmitter output power in watts
G_t = numeric gain of the transmitting antenna (unitless)
E = electric field strength in V/m = $10^{((dB\mu V/m)/20)}/10^6$
d = measurement distance in meters (m) = 3m

So P_t = $(E \times d)^2/(30 \times G_t)$
Field strength = 62.53 dBµV/m @3m
Antenna gain =0.0 dBi, so numeric gain=1.0
Therefore
P_t= {$[10^{(60.62/20)}/10^6 \times 3]^2/(30 \times 1.0)$}x1000 mW = 0.00035 mW = -34.61 dBm

The maximum output power for the 13.56 MHz transmission mode of the device is 0.00035 mW which corresponds to -34.61 dBm.

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Appendix B: ISED RF Exposure information

ISED RF Exposure evaluation for mobile devices

According to RSS-102 Issue 5, Paragraph "4. Exposure Limits", Industry of Canada has adopted the RF field strength limits established in Health Canada's RF exposure guideline, Safety code 6:

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m²)	Reference Period (minutes)
0.003-10²¹	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142\,f^{0.3417}$	$0.008335\,f^{0.3417}$	$0.02619\,f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158\,f^{0.5}$	$4.21 \times 10^{-4}\,f^{0.5}$	$6.67 \times 10^{-5}\,f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

Table 6: RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m²)	Reference Period (minutes)
0.003-10²³	170	180	-	Instantaneous*
0.1-10	-	$1.6/f$	-	6**
1.29-10	$193/f^{0.5}$	-	-	6**
10-20	61.4	0.163	10	6
20-48	$129.8/f^{0.25}$	$0.3444/f^{0.25}$	$44.72/f^{0.5}$	6
48-100	49.33	0.1309	6.455	6
100-6000	$15.60\,f^{0.25}$	$0.04138\,f^{0.25}$	$0.6455\,f^{0.5}$	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	$616000/f^{1.2}$
150000-300000	$0.354\,f^{0.5}$	$9.40 \times 10^{-4}\,f^{0.5}$	$3.33 \times 10^{-4}\,f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

ISED MPE Evaluation

Each supported transmission technology will be evaluated to determine if it is in compliance with RSS-102 Issue 5, RF Field Strength Limits for devices used by the General Public.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction:

Power density: $S[W/m^2] = \dfrac{P_{E.I.R.P.}[W]}{4\Pi R[m]^2}$

Minimum compliance distance: $R_{\min}[m] = \sqrt{\dfrac{P_{E.I.R.P.}[W]}{4\Pi S[W/m^2]}}$

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

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Multiple frequencies assessment

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure toward the total exposure at a fixed location. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less than unity:

$$\sum_{i=1}^{n} \frac{S_i}{MPE_i} < 1$$

Where

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MPE_i is the power flux density basic restriction of each source.

NFC assessment

As stated into DEKRA Testing and Certification, S.A.U. test report 60085RRF.002 the maximum measured field strength for the operating frequency is:

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Table 7: Measurement Results

Using Field Strength Approach formula (linear terms):

$E.I.R.P = P_t \times G_t = (E \times d)^2/30$

Where:
P_t = transmitter output power in watts
G_t = numeric gain of the transmitting antenna (unitless)
E = electric field strength in V/m = $10^{((dB\mu V/m)/20)}/10^6$
d = measurement distance in meters (m) = 3m

So $P_t = (E \times d)^2/(30 \times G_t)$
Field strength = 62.53 dBµV/m @3m
Antenna gain =0.0 dBi, so numeric gain=1.0
Therefore
$P_t = \{[10^{(60.62/20)}/10^6 \times 3]^2/(30 \times 1.0)\} \times 1000$ mW = 0.00035 mW = -34.61 dBm

The maximum output power for the 13.56 MHz transmission mode of the device is 0.00035 mW which corresponds to -34.61 dBm.