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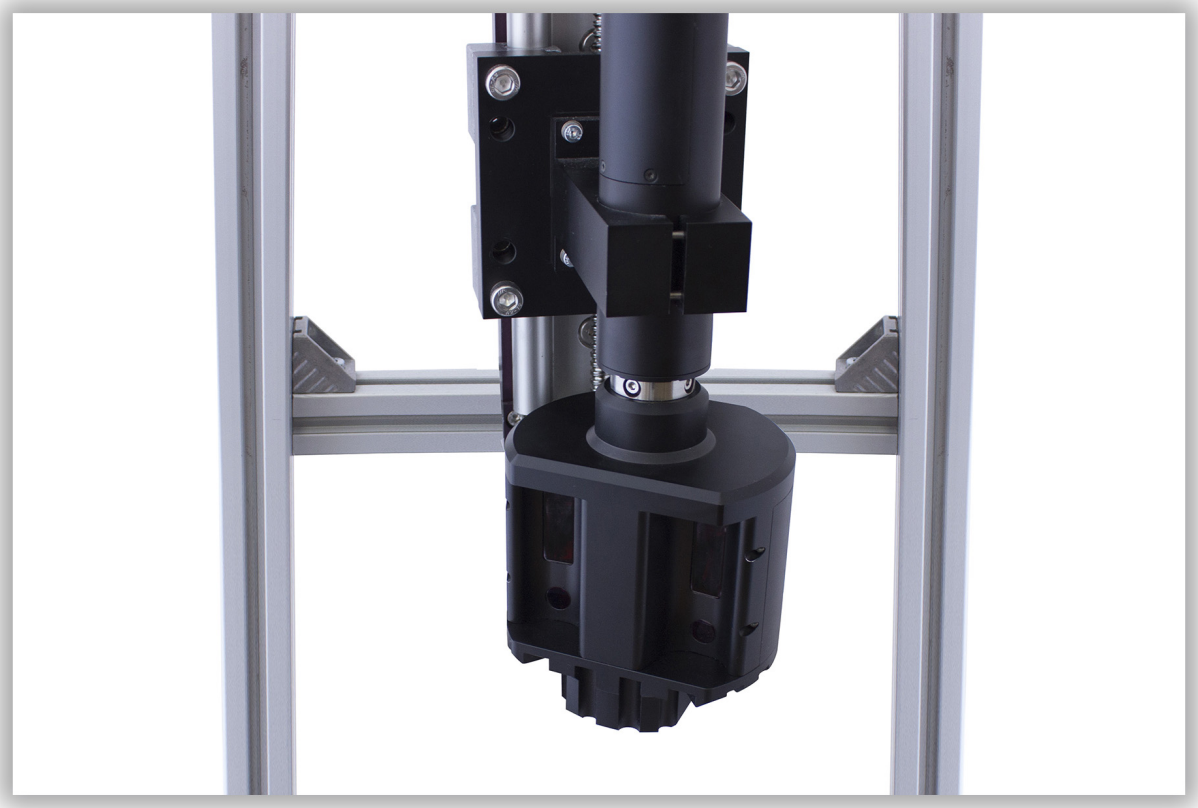


RECTANGULAR INNER PROFILE MEASUREMENT SYSTEM

RF096-170x110 Series

User's manual

www.riftek.com
info@riftek.com

Contents

1. Safety precautions

- Use supply voltage and interfaces indicated in the system specifications.
- In connection/disconnection of cables, the system power must be switched off.
- Do not use the system in locations close to powerful light sources.
- The system must be grounded.

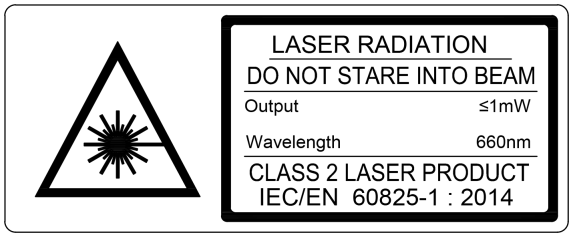
2. CE compliance

The system has been developed for use in industry and meets the requirements of the following Directives:

- EU directive 2014/30/EU. Electromagnetic compatibility (EMC).
- EU directive 2011/65/EU, “RoHS“ category 9.

3. Laser safety

The system makes use of a c.w. 660 nm wavelength semiconductor laser. The maximum output power is 1 mW. The system belongs to the 2 laser safety class according to IEC/EN 60825-1:2014. The following warning label is placed on the housing:



The following safety measures should be taken while operating the system:

- Do not target laser beam to humans.
- Do not disassemble the laser sensor.
- Avoid staring into the laser beam.

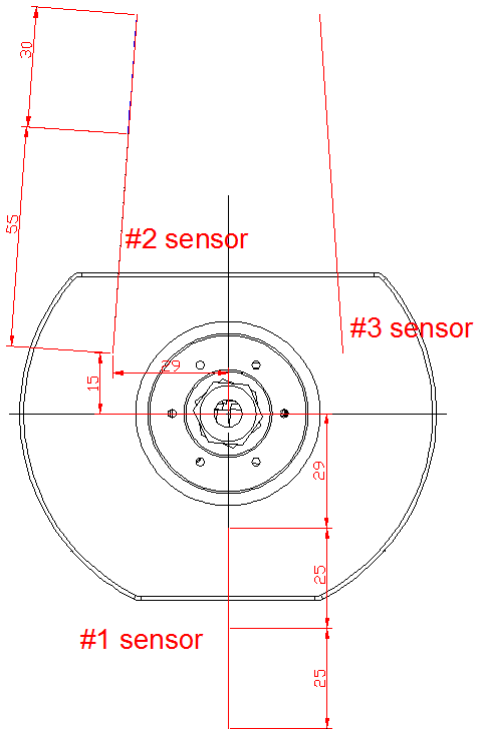
4. General information

The system is intended for non-contact scanning and inner dimensions measurement of objects having special profile.

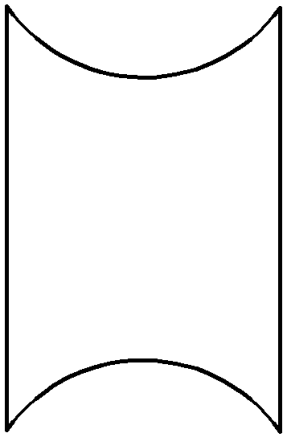
5. Basic technical data

Parameter		Value
Base distance/measurement range (#1 sensor), mm		25/25
Base distance/measurement range (#2 sensor), mm		55/30
Base distance/measurement range (#3 sensor), mm		55/30
Profile measurement accuracy, mm		±0.02
Space resolution, points/turnover		3200
Light source		red semiconductor laser, 660 nm wavelength
Laser output power, mW		<1
Laser safety class		2 (IEC60825-1)
Laser beam shape		Round
Output interface		Ethernet (UDP)
Power supply, V		9…24
Power consumption, W		5 (standby mode), 12 (scan mode)
Environmental resistance	Vibration	20 g / 10…1000 Hz, 6 hours for each of XYZ axes
	Shock	30 g / 6 ms
	Permissible ambient light, lx	30000
	Relative humidity, %	5-95 (no condensation)
	Operating ambient temperature, °C	0…+45
	Storage temperature, °C	-20…+70
Housing material		aluminum
Weight (without cable), gram		1500

NOTE. Technical characteristics of the system can be changed for a specific task.



Measurement head



Measured profile

6. Example of item designation when ordering

RF096-LxW

Symbol	Description
L	Profile length, mm
W	Profile width, mm

Example: RF096-170x110 – Rectangular Inner Profile Measurement System, measurement range: Length - 170 mm , Width - 110 mm.

7. Structure and operating principle

Operation of the system is based on the scanning of the hole inner surface by rotating triangulation laser sensors.

The system contains the measurement head with three laser sensors inside, Figure 1.

The measurement head is mounted on the rotation module.

Radiation of semiconductor lasers from the sensors is focused onto the object surface. Radiation reflected by the surface is collected by input lens of the sensors. Rotating laser sensors scan the inner surface of the object, and the system transmits polar coordinates of the surface (distance from the rotation axis measured by the sensors and a corresponding angle of rotation) to the PC for calculating the required geometric parameters.

Overall and mounting dimensions of the system are shown in Figure 1.

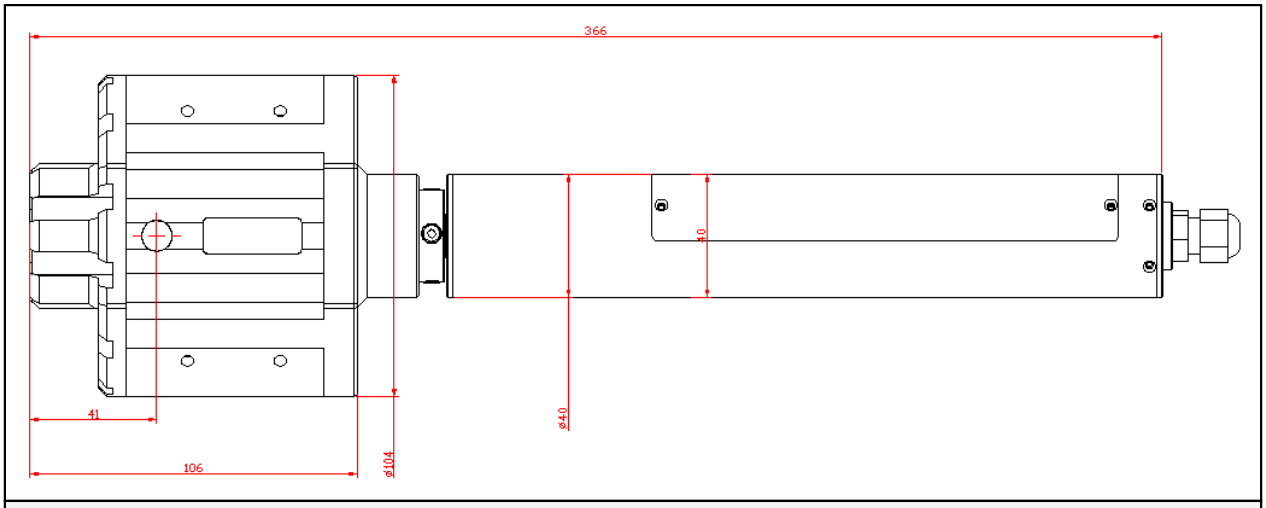


Figure 1. Overall and mounting dimensions of the system

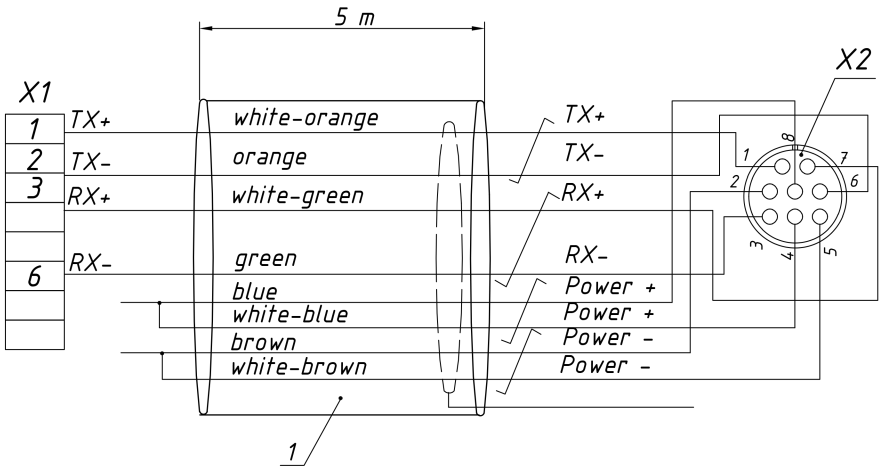
8. Overall demands for mounting

The system is positioned so that the object under control has to be placed within the working range of the system.

ATTENTION!
The system must be grounded – static electricity may cause the failure of electronic components.

9. Connection

9.1. Designation of connector contacts



Designations:

1	Cable F/UTP CAT 5e
X1	RJ-45
X2	Binder 09 0426 10 08

Assignment:

Pin number	Assignment	Wire color	Note
1	TX+	White-orange	Transmit data Ethernet +
6	TX-	Orange	Transmit data Ethernet -
7	RX+	White-green	Receive data Ethernet +
3	RX-	Green	Receive data Ethernet -
8	Power+	Blue	Power supply: 9...24 V Power consumption: 5 W (standby mode), 12 W (scan mode)
4	Power+	White-blue	
2	Power-	Brown	
5	Power-	White-brown	

9.2. Cable

Designation of cable wires is given in the table below:

Pin number		Assignment #09 0426 10 08	Wire color
RJ-45	1	TX+	White-orange
RJ-45	2	TX-	Orange
RJ-45	3	RX+	White-green
RJ-45	6	RX-	Green
free lead	-	AL (output)	White-blue
free lead	-	Power+	Blue
free lead	-	IN (input)	White-brown
free lead	-	Power-	Brown

10. Network setting

All systems are shipped with the following default network configuration: IP address of the system – 192.168.0.3.

Configure the network card of your PC in the following address space: 192.168.0.X. Connect the system directly to PC or through the network switch.

11. Indended use

11.1. Preparation for use

Preparation of the system includes:

- Visual inspection.
- Installation and connection.
- Adjustment.
- Switching on the system.

11.1.1. Visual inspection

Before operating, it is needed to ensure of the serviceability of the equipment:

- Check the system for completeness and absence of damage.
- Check the cable and ground wire.
- Check the condition of output windows and, if necessary, wipe them with a soft cloth.

11.1.2. Installation and connection

- Install the system onto a linear translation mechanism (or onto the industrial robot).
- Make the electrical connections in accordance with the cable wires designation.

11.1.3. Adjustment

The system is positioned so that the object under control has to be placed within the working range of the system and on the laser beam axis.

11.1.4. Switching on the system

Feed power to the system – 9…24 V.

11.2. Operating the system

The measurement process is fully automated and operation of the system is reduced to the work with the software.

12. Service software

12.1. General information

The service software is intended for:
- Testing and demonstration of the work of the system.
- Setting parameters.
- Calibration.

The service software includes:
- SDK library.
- RF096 Test Program.

12.2. System requirements

- Operating system Windows 7 and later.
- Microsoft Visual C++ Runtime Redistributable for Windows 64-bit. Shipped with the package (you need to run **vcredist_x64.exe**).

12.3. SDK library

SDK contents:

File	Description
rf096021.dll	Dynamic link library.
rf096021.h	C header file. Refer to this file to understand the SDK functions. There is the detailed description for each of them.
rf096021.lib	LIB file to link DLL to the project.

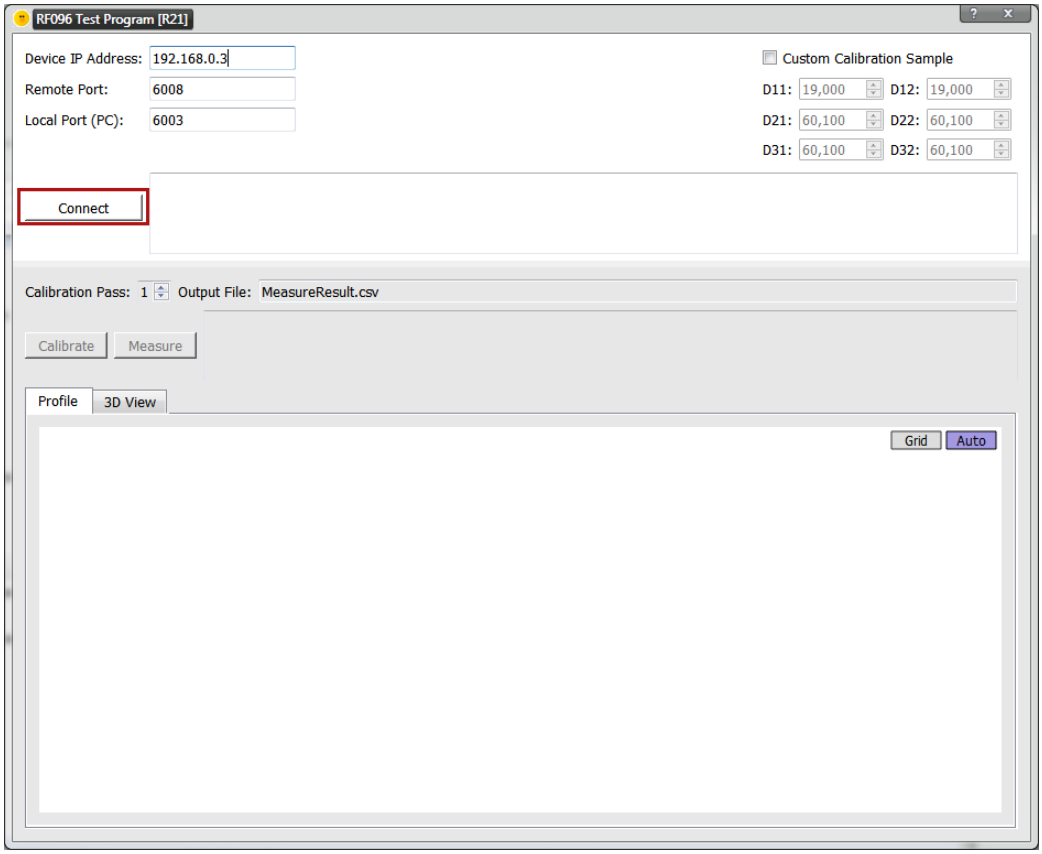
SDK usage scenario:

Step	Description
1	Call *rf096021_init()* on program start.
2	Call *rf096021_connect()* to connect to the device. Returns true on success, false on failure.
3	Call *rf096021_calibrate()* to run the calibration process. Returns true on success, false on failure.
4	Call *rf096021_measure()* to run the measurement process. Returns true on success, false on failure.
5	Call *rf096021_disconnect()* to disconnect from the device.
6	Call *rf096021_deinit()* before your program ends to cleanup the memory allocated by the library.

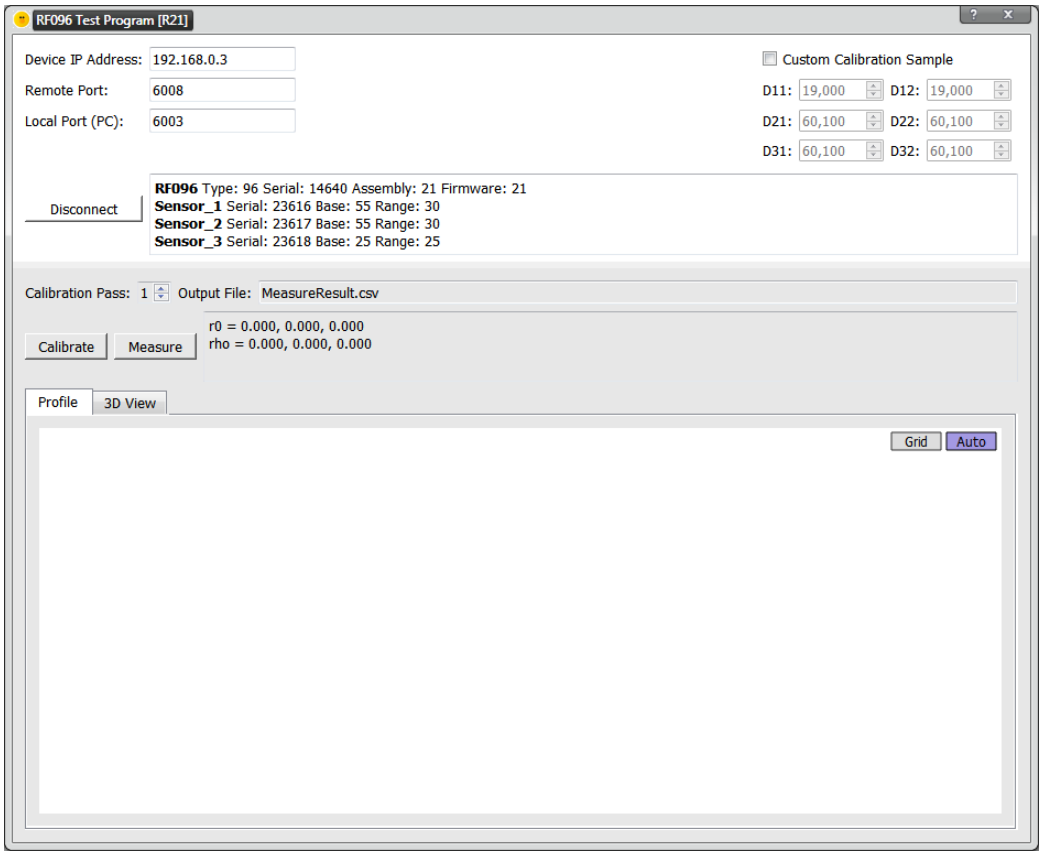
12.4. RF096 Test Program

12.4.1. Connection

When you run the program, parameters fields (**Device IP Address**, **Remote Port**, **Local Port**) are populated with factory defaults. If you didn't change the system parameters, you can click the **Connect** button in order to connect to the system. Otherwise, change factory defaults to the actual system parameters and then click **Connect**.



When the connection is established, the system information will be displayed:



To disconnect from the system, click **Disconnect**.

12.4.2. Calibration

> **ATTENTION!**
> 1. It is imperative to perform the calibration procedure before the first use.
> 2. While using the system, you can repeat the calibration procedure in case of obtaining incorrect results.

The calibration must be performed by using the calibration block supplied with the system.

The calibration procedure:

Step	Description
1	Install the calibration block: the bottom side is the side with the axes designation, the axes designation must be to the left.
2	Install the system inside the calibration block so that a laser beam of sensor #1 was in the center of the left semicircle.
3	Click the **Calibrate** button and wait until the calibration is complete.

12.4.3. Measurement

When you have calibrated the system, it's ready to run the measurement.

Click the **Measure** button in order to start the measurement process.

The program will display the calculated values.

You may turn on and off a scale grid by clicking the **Grid** button.

You may zoom and move the image when the **Auto** button is unpressed (shown in gray). To zoom the image, use the mouse wheel. To move the image, press the left mouse key and move the cursor.

13. Warranty policy

Warranty assurance for the Rectangular Inner Profile Measurement System RF096-170x110 Series - 24 months from the date of putting in operation; warranty shelf-life - 12 months.

14. Revisions

Date	Revision	Description
24.04.2018	1.0.0	Starting document.

15. Distributors

AUSTRALIA

Applied Measurement Australia Pty Ltd
RAILWAY INSTRUMENTS ONLY
Thornton Plaza, Unit 5,
27 Thornton Crescent, Mitcham
VIC 3132, Australia
Tel: +61 39874 5777
Fax: +61 39874 5888
sales@appliedmeasurement.com.au
www.appliedmeasurement.com.au

BELGIUM

Althen Sensors & Controls BV
Verrijn Stuartlaan 40, 2288 EL,
Rijswijk, Leidschendam
The Netherlands
Tel: +31 0 70 392 4421
Tel: +31 0 61 396 7830
Tel: +31 0 64 323 8393
sales@althen.nl
info@althen.nl
www.althensensors.com

BOSNIA AND HERZEGOVINA

ASCO RAIL sp. z o.o.
EXCLUSIVE REPRESENTATIVE FOR RAILWAY EQUIPMENT
ul. Wielowiejska 53, 44-120
Pyskowice, Poland
Tel: +48 32 230 45 70
Fax: + 48 32 233 21 34
biuro@ascorail.pl
export@ascorail.pl
www.ascorail.pl

BRAZIL

CAPI Controle e Automação Ltda
Rua Itororó, 121, CEP 13466-240
Americana-SP, Brazil
Tel: +55 19 36047068
Fax: +55 19 34681791
capi@capicontrole.com.br
www.capicontrole.com.br

BULGARIA

ASCO RAIL sp. z o.o.
EXCLUSIVE REPRESENTATIVE FOR RAILWAY EQUIPMENT
ul. Wielowiejska 53, 44-120
Pyskowice, Poland
Tel: +48 32 230 45 70
Fax: + 48 32 233 21 34
biuro@ascorail.pl
export@ascorail.pl
www.ascorail.pl

CHILE

MOL INGENIERIA LTDA
EXCLUSIVE REPRESENTATIVE FOR RAILWAY EQUIPMENT
República de Honduras 11936
Las Condes, Santiago de Chile
Tel: +56 9 59200362
hconcha@molingenieria.com
www.molingenieria.com

CHILE

Verne SpA
Apoquindo 2818, oficina 31
Las Condes, Santiago, Chile
Tel: +56 2 228858633
info@verne.cl
jsaavedra@verne.cl
www.verne.cl

CHINA

Beijing Haiwei Lutong Technology Co., Ltd
Yard 1, Tianxing Street, Fangshan District, Beijing, China
Tel: +86 10 8366 1866
Fax: +86 10 8366 1866
info@haiwlt.com
www.haiwlt.com

CHINA

Chongqing Wolf Industrial Technology Co., Ltd
Room 2307 / 2308, Light of City international business building,
No. 19 Jiangnan Avenue, Nan'an District, Chongqing, China
Tel: 023 62832618
Fax: 023 62832113
info@wolf-hk.com
www.wolf-hk.com

CHINA

Beijing Gemston Mechanical & Electrical Equipment Co., Ltd
RAILWAY INSTRUMENTS ONLY
Room 613, Anfu Mansion, Fengtai District, Beijing, China
Tel: +86 10 6765 0516
Fax: +86 10 6765 6966
Mobile: +86 137 1755 1423
dh0526@163.com
www.baoft.cn

CHINA

Xi'an Win-Success Automation Technology Co.,Ltd
Room 3-1-1039, Iduhui Building,
No.11 Tangyan South Road
High-Tech Zone, Xi'an
Shaanxi PRC, China
Tel: +86 29 81106280
Fax: +86 29 81106285
Mob: +86 133 19271405
info@maxsenor.com
www.maxsensor.com

CHINA

Micron-Metrology co., Ltd
No.2, Kecheng Rd., Industrial Park
District, Suzhou,
Jiangsu Province., China
Tel: 0512 65589760
Mob: +86 189 1806 9807
sales@micron-metrology.cn
www.micron-metrology.cn

CHINA

Zhenshangyou Technologies Co., Ltd
Rm 2205-2210, Zhongyou Hotel
1110 Nanshan Road, Nanshan
District 518054 Shenzhen, China
Tel: +86 755-26528100/8011/8012
Fax: +86 755-26528210/26435640
info@51sensors.com
www.51sensors.com

CROATIA

ASCO RAIL sp. z o.o.
EXCLUSIVE REPRESENTATIVE FOR RAILWAY EQUIPMENT
ul. Wielowiejska 53, 44-120
Pyskowice, Poland
Tel: +48 32 230 45 70
Fax: + 48 32 233 21 34
biuro@ascorail.pl
export@ascorail.pl
www.ascorail.pl

CZECH REPUBLIC

ASCO RAIL sp. z o.o.
EXCLUSIVE REPRESENTATIVE FOR RAILWAY EQUIPMENT
ul. Wielowiejska 53, 44-120
Pyskowice, Poland
Tel: +48 32 230 45 70
Fax: + 48 32 233 21 34
biuro@ascorail.pl
export@ascorail.pl
www.ascorail.pl

DENMARK

BLConsult
Ryssbält 294
95 291 Kalix, Sweden
Tel: +46 70 663 19 25
info@blconsult.se
www.blconsult.se

ESTONIA

FoodLab OÜ
Haabersti Iinnaosa, Astangu tn 52
13519 Eesti, Tallinn, Estonia
Tel: +372 56 363110
foodlab.ee@gmail.com

FINLAND

Kvalitest Industrial AB
EXCEPT FOR RAILWAY INSTRUMENTS
Ekbacksvägen 28,
16869 Bromma, Sweden
Tel: +46 0 76 525 5000
sales@kvalitest.com
www.kvalitest.com
www.kvalitest.se

FINLAND

TERÄSPYÖRÄ-STEELWHEEL OY
RAILWAY INSTRUMENTS ONLY
Juvan teollisuuskatu 28
FI-02920 ESPOO, Finland
Tel: +358 400 422 900
Fax: +358 9 2511 5510
steelwheel@steelwheel.fi
www.teraspyora.fi

FRANCE

BLET Measurement Group S.A.S.
1 avenue du Président Georges Pompidou, 92500 Rueil Malmaison, France
Tel: + 33 0 1 80 88 57 85
Fax: +33 0 1 80 88 57 93
technique@blet-mesure.fr
www.blet-mesure.fr

GERMANY

Disynet GmbH
Breyeller Str. 2, 41379
Brueggen, Germany
Tel: +49 2157 8799 0
Fax: +49 2157 8799 22
disynet@sensoren.de
www.sensoren.de

GERMANY

Finger GmbH & Co. KG
OPTICAL MICROMETERS ONLY
Sapelloh 172, 31606
Warmsen, Germany
Tel: +49 5767 96020
Fax: +49 5767 93004
finger@finger-kg.de
www.finger-kg.de

GERMANY

ALTHEN GmbH Meß- und Sensortechnik
Dieselstrasse 2, 65779
Kelkheim, Germany
Tel: +49 0 6195 7 00 60
info@althen.de
www.althensensors.com/de/

HUNGARY

ASCO RAIL sp. z o.o.
EXCLUSIVE REPRESENTATIVE FOR RAILWAY EQUIPMENT
ul. Wielowiejska 53, 44-120
Pyskowice, Poland
Tel: +48 32 230 45 70
Fax: + 48 32 233 21 34
biuro@ascorail.pl
export@ascorail.pl
www.ascorail.pl

INDIA

Influx Big Data Solutions Pvt Ltd
No:2, Krishvi, Ground Floor,
Old Airport Road, Domlur,
Bangalore - 560071, India
Tel: +91 73 37748490
Tel: +91 94 48492380
milan@influxtechnology.com
support_india@influxtechnology.com
www.influxtechnology.com

INDIA

Paragon Instrumentation Engineers Pvt. Ltd.
RAILWAY INSTRUMENTS ONLY
200, Station Road,
Roorkee, 247 667, India
Tel: +91 1332 272394
tanuj@paragoninstruments.com
www.paragoninstruments.com

INDONESIA

PT. DHAYA BASWARA SANIYASA
Botanic Junction Blok H-9 NO. 7
Mega Kebon Jeruk, Joglo
Jakarta,11640, Indonesia
Tel: +62 21 2932 5859
management@ptdbs.co.id

ISRAEL

Nisso Dekalo Import Export LTD
1 David Hamelech Street
Herzlia 46661 Israel
Tel: +972 99577888
Fax: +972 99568860
nissodekaloltd@outlook.com
www.fly-supply.net
www.aircraft-partsupply.com

ITALY

FAE s.r.l.
Via Tertulliano, 41
20137 Milano, Italy
Tel: +39 02 55187133
Fax: +39 02 55187399
fae@fae.it
www.fae.it

JAPAN

Tokyo Instruments, Inc.
6-18-14 Nishikasai, Edogawa-ku,
Tokyo, 134-0088 Japan
Tel: +81 3 3686 4711
Fax: +81 3 3686 0831
f_kuribayashi@tokyoinst.co.jp
www.tokyoinst.co.jp

LATVIA

FoodLab OÜ
Haabersti linnaosa, Astangu tn 52
13519 Eesti, Tallinn, Estonia
Tel: +372 56363110
foodlab.ee@gmail.com

LUXEMBOURG

Althen Sensors & Controls BV
Verrijn Stuartlaan 40, 2288 EL,
Rijswijk, Leidschendam
The Netherlands
Tel: +31 0 70 392 4421
Tel: +31 0 61 396 7830
Tel: +31 0 64 323 8393
sales@althen.nl
info@althen.nl
www.althensensors.com

MALAYSIA

OptoCom InstruVentures
H-49-2, Jalan 5, Cosmoplex
Industrial Park, Bandar Baru
Salak Tinggi, Sepang, Malaysia
Tel: 603 8706 6806
Fax: 603 8706 6809
optocom@tm.net.my
www.optocom.com.my

MONTENEGRO

ASCO RAIL sp. z o.o.
EXCLUSIVE REPRESENTATIVE FOR RAILWAY EQUIPMENT
ul. Wielowiejska 53, 44-120
Pyskowice, Poland
Tel: +48 32 230 45 70
Fax: + 48 32 233 21 34
biuro@ascorail.pl
export@ascorail.pl
www.ascorail.pl

NETHERLANDS

Althen Sensors & Controls BV
Verrijn Stuartlaan 40, 2288 EL,
Rijswijk, Leidschendam
The Netherlands
Tel: +31 0 70 392 4421
Tel: +31 0 61 396 7830
Tel: +31 0 64 323 8393
sales@althen.nl
info@althen.nl
www.althensensors.com

NORWAY

BLConsult
Ryssbält 294,
95 291 Kalix, Sweden
Tel: +46 70 663 19 25
info@blconsult.se
www.blconsult.se

NORWAY

Salitec AS
PB 468, N-1327
Lysaker, Norway
Tel: +47 23 891015
Fax: +47 92101005
mail@salitec.no
www.salitec.no

PERU

Verne Perú S.A.C.
Las Codornices 104,
Surquillo, Lima, Peru
Tel/fax: +51 992436734
info@verne.cl
www.verne.cl

POLAND

ASCO RAIL sp. z o.o.
EXCLUSIVE REPRESENTATIVE FOR RAILWAY EQUIPMENT
ul. Wielowiejska 53, 44-120
Pyskowice, Poland
Tel: +48 32 230 45 70
Fax: + 48 32 233 21 34
biuro@ascorail.pl
export@ascorail.pl
www.ascorail.pl

POLAND

RIFTEK EUROPE sp. z o.o.
ul. Domaniewska 17/19, 02-672
Warsaw, Poland
info@riftek.com
www.riftek.com

PORTUGAL

Campal Inovacoes Ferroviarias Lda.
Lagoas Park, Edifício 7, 1° Piso
Sul, 2740-244 Porto Salvo, Oeiras,
Portugal
Tel: +351 21 584 4348
campal@campal.pt
www.campal.pt

SERBIA

ASCO RAIL sp. z o.o.
EXCLUSIVE REPRESENTATIVE FOR RAILWAY EQUIPMENT
ul. Wielowiejska 53, 44-120
Pyskowice, Poland
Tel: +48 32 230 45 70
Fax: + 48 32 233 21 34
biuro@ascorail.pl
export@ascorail.pl
www.ascorail.pl

SLOVAKIA

ASCO RAIL sp. z o.o.
EXCLUSIVE REPRESENTATIVE FOR RAILWAY EQUIPMENT
ul. Wielowiejska 53, 44-120
Pyskowice, Poland
Tel: +48 32 230 45 70
Fax: + 48 32 233 21 34
biuro@ascorail.pl
export@ascorail.pl
www.ascorail.pl

SLOVENIA

ASCO RAIL sp. z o.o.
EXCLUSIVE REPRESENTATIVE FOR RAILWAY EQUIPMENT
ul. Wielowiejska 53, 44-120
Pyskowice, Poland
Tel: +48 32 230 45 70
Fax: + 48 32 233 21 34
biuro@ascorail.pl
export@ascorail.pl
www.ascorail.pl

SOUTH KOREA

BS Holdings
B-201,Wonpogongwon 1ro,
59 Danwon-gu, Ansan-si,
Gyeonggi-do 15455, Republic of
Korea
Tel: +82 31 411 5011
Fax: +82 31 411 5015
bsh5011@hanmail.net
www.lasersolution.co.kr

SOUTH KOREA

PROSEN. CO., LTD
M-1001, Songdo techno park IT
center, 32, Songdogwahak-ro,
Yeonsu-gu, Incheon, 21984,
Republic of Korea
Tel: +82 32 811 3457
Fax: +82 32 232 7458
trade@prosen.co.kr
www.prosen.co.kr

SPAIN

IBERFLUID Instruments S.A.
C/ Botanica, 122, 08908
L'Hospitalet de Llobregat
Barcelona
Tel: +34 93 447 10 65
Fax: +34 93 334 05 24
myct@iberfluid.com
www.iberfluid.com

SWEDEN

BLConsult
Ryssbält 294,
95 291 Kalix, Sweden
Tel: +46 70 663 19 25
info@blconsult.se
www.blconsult.se

SWEDEN

Kvalitest Industrial AB
EXCEPT FOR RAILWAY INSTRUMENTS
Ekbacksvägen 28,
16869 Bromma, Sweden
Tel: +46 0 76 525 5000
sales@kvalitest.com
www.kvalitest.com
www.kvalitest.se

SWITZERLAND

ID&T GmbH
Gewerbestrasse 12/a
8132 Egg (Zurich), Switzerland
Tel: + 41 44 994 92 32
Fax: + 41 44 994 92 34
info@idtlaser.com
www.idtlaser.com

THAILAND

Advantech Solution Co., Ltd.
20/170 Motorway Rd.,
Kwang Pravet, Khet Pravet,
Bangkok, Thailand 10250
Tel: +662 1848705
Fax: +662 1848708
sales@advantechsolution.com
www.advantechsolution.com

TURKEY

MAK Elektronik Malzeme Analiz ve Kalite Kontrol Cihazlari Dis Tic. Ltd. Sti.
Cenap Sahabettin Sokak, No:39,
34718 Kosuyolu - Kadikoy /
Istanbul - TURKEY
Tel: +90 216 402 10 34
Fax: +90 216 402 10 35
ulastac@metalografi.net
www.makelektronik.com.tr

TURKEY

TEKMA Mühendislik A.S.
Cevizli Mh. M. Kemal Cd.,
Hukukçular Towers,
A-Blok, No: 66-A/39
Kartal - Istanbul
Tel: +90 216 970 1318
Tel: +90 850 840 2334
info@tekma.eu
www.tekma.eu

UKRAINE

KODA
Frunze st. 22, 61002,
Harkov, Ukraine
Tel/Fax: +38 057 714 26 54
mail@koda.com.ua
www.koda.com.ua

UNITED KINGDOM, IRELAND

Althen UK
Northamptonshire
United Kingdom
Tel: +44 0 7823 921427
t.stoyles@althen.co.uk
www.althensensors.com
www.althencontrols.com

USA

Althen Sensors & Controls
2531 Bradley St., Oceanside, CA,
92056, USA
Tel: 858 633 3572
r.ream@althensensors.com

USA, CANADA, MEXICO

Acuity Products of Schmitt Industries, Inc.
2765 NW Nicolai Street
Portland, OR, 97210, USA
Tel: +1 503 227 7908
Fax: +1 503 223 1258
sales@acuitylaser.com
www.acuitylaser.com

USA, CANADA, MEXICO

International Electronic Machines Corporation
RAILWAY INSTRUMENTS ONLY
850 River Street, Troy,
New York, USA
Tel: +1 518 268-1636
Fax: +1 518 268-1639
marketing@iem.net
www.iem.net