Product Overview
Automotive Test Solutions

Automotive Test Solutions

GÖPEL electronic
Enjoy Testing

Contents

Single Components

Communication controller

Series 62

Flexible multibus controller for CAN/CAN FD/FlexRay/
Automotive Ethernet/LIN

- available as stand-alone boxes in a range of performance classes and as PCIe/PXIe cards
- up to 18 independent bus interfaces
- additional digital and analogue I/O channels as well as SENT Tx/Rx interfaces available
- execution of user applications directly on the hardware within a real-time operating system
- rest bus simulations and testing of complex control units
- transport and diagnostic protocols, network management, XCP, SecOC, etc. provided directly on the hardware
- ideal for high-performance flashing of control units

Configuration overview: Bus interfaces Series 62

Interface	G PCIe 6281, G PXIe 6281, G CAR 6281			G CAR 6282		
	configuration 1	configuration 2	configuration 4*	configuration 1	configuration 2	configuration 3
1	CAN FD	LIN	CAN FD	CAN FD	CAN FD	CAN FD
2	CAN FD	LIN	CAN FD	CAN FD	CAN FD	CAN FD
3	CAN FD	LIN	CAN FD	CAN FD	CAN FD	CAN FD
4	CAN FD	LIN	CAN FD	CAN FD	CAN FD	CAN FD
5	CAN FD	LIN	LIN	CAN FD	LIN	CAN FD
6	CAN FD	LIN	LIN	CAN FD	LIN	CAN FD
7	CAN FD 100/1000Base-T1	LIN 100/1000Base-T1	LIN 100/1000Base-T1	CAN FD	LIN	CAN FD
8	CAN FD 100/1000Base-T1	LIN 100/1000Base-T1	LIN 100/1000Base-T1	CAN FD	LIN	CAN FD
9	-	-	-	LIN	LIN	LIN
10	-	-	-	LIN	LIN	LIN
11	-	-	-	LIN	LIN	LIN
12	-	-	-	LIN	LIN	LIN
13	-	-	-	CAN FD	LIN	FlexRay A-channel
14	-	-	-	CAN FD	LIN	FlexRay B-channel
15	-	-	-	CAN FD	LIN	FlexRay A-channel
16	-	-	-	CAN FD	LIN	FlexRay B-channel
17	-	-	-	100/1000Base-T1	100/1000Base-T1	100/1000Base-T1
18	-	-	-	100/1000Base-T1	100/1000Base-T1	100/1000Base-T1

*configuration 3 of 6281 is reserved. Further configurations on request

basic CAN · PCI · USB · PXI 6153

CAN Bus Controller

- CAN applications in the automotive industry
- up to four independent Full CAN controllers
- CAN protocol according to specifications 2.0 A/2.0 B, CAN-FD
- real-time simulation of ECUs through intelligent Power PC-based CAN interface
- freely selectable transceiver for each CAN interface
- transport and diagnostic protocols, network management, XCP, SecOC, etc. provided directly on the hardware

*functional scope can be optionally expanded

basicCAN 61 PLUS

CAN Bus Controller

- feed-in option for the power supply under test via two 4 mm banana sockets on the rear of the device
- breakout panel with separate 9-pin D-Sub connector for each communication interface
- four 4 mm banana sockets on the front of the unit (2x Terminal 30, 1x Terminal 31, 1x Terminal 15 - can be switched on/off using relay with max. 5 A)
- 9 status LEDs on the front of the unit

*functional scope can be optionally expanded

CAN
CAN FD
K-Line

basicLIN · PCI · USB · PXI 6173

LIN-/K-Line Controller

- LIN and K-Line applications in the automotive industry
- up to four independent LIN/K-Line interfaces
- LIN protocol according to specifications 2.0/2.1/2.2
- K-Line in accordance with ISO 9141
- adjustable transceiver supply
- each LIN interface can be configured separately as master or slave
- On-board diagnostics functions for LIN and K-Line
- all interfaces electrically isolated

*functional scope can be optionally expanded

lin
K-Line

basicCAR · PCI · USB · PXI 6181

Multibus Controller

- suitable for CAN and LIN applications in the automotive industry
- ideal for multibus ECUs
- 2 x CAN and 2 x LIN or K-Line
- freely selectable transceiver for each CAN interface
- transport and diagnostic protocols, network management, XCP, SecOC, etc. provided directly on the hardware
- all interfaces electrically isolated

*functional scope can be optionally expanded

CAN
CAN FD
lin
K-Line

basicFlex · PCI · USB · PXI 6191

FlexRay Controller

- FlexRay applications in the automotive industry
- two independent FlexRay nodes for cold-start capability
- supports A and B channels
- cyclical transmission of FlexRay messages
- event-based transmission of FlexRay messages
- monitoring of bus data and events with time stamp
- transport and diagnostic protocols, network management, XCP, SecOC, etc. provided directly on the hardware
- all interfaces electrically isolated

*functional scope can be optionally expanded

FlexRay™

PXI 6141

Ethernet Controller

- Ethernet applications in the automotive industry
- up to four interfaces
- 100/1000 Base-T1, 10/100/1000 Base-T
- Test Acces Point (TAP) on all interfaces via TAP-Matrix
- high-performance Power PC as simulation processor
- log data acquisition on all interfaces with precise hardware time stamp
- supports Diagnostics over IP (DoIP)

AUTOMOTIVE ETHERNET

basic MOST · PXI 6161

MOST150 Controller

- MOST protocol for 150 Mbit/s oPHY
- choice of frame rate: 44.1 kHz/48 kHz
- MOST High protocol V2.2 on packet/control channel
- on-board diagnostics via MOST High protocol V2.2 /TP2.0
- ring break diagnostics/ECL
- additional front-panel Ethernet port
- optional S/PDIF input/output
- additional triggers – front-panel inputs/outputs
- two optional CAN and/or LIN interfaces

Configuration overview: Expansion capabilities of Series 61 modules

	PXI 6153 / PCI 6153	PXI 6173 / PCI 6173	PXI 6181 / PCI 6181	PXI 6191 / PCI 6191
port 1	CAN	LIN/K-Line	CAN	FlexRay
port 2	CAN	LIN/K-Line	LIN/K-Line	FlexRay
port 3	option 1	option 1	option 1	option 1
port 4	option 1	option 1	option 1	option 1
port 5	option 2	option 2	option 2	option 1
port 6	option 2	option 2	option 2	option 1
analogue / digital I/O	option 3 / option 4	option 3 / option 4	option 3 / option 4	option 3 / option 4

Option 1: additional CAN or LIN/K-Line port / **Option 2:** additional FlexRay port / **Option 3:** four additional digital inputs; four additional digital outputs; six analogue inputs; six analogue outputs / **Option 4:** four additional digital inputs; four additional digital outputs; four analogue inputs; four analogue outputs

Expansion modules for Series 61 controller

- CAN transceiver modules:
  - *TJA1044GT - CAN FD*
  - *TJA1041A - High Speed CAN*
  - *TJA1054 - Low Speed CAN*
  - *NCV7356D1G - Single Wire CAN*
- LIN transceiver module TJA1020
- K-Line transceiver module L9637
- FlexRay transceiver module TJA1080
- analogue/digital I/O modules in various voltage ranges

*further types available on request

EasyCON 1000Base-T1

Media converter EasyCON 1000Base-T1

- connects the physical layer of Automotive Ethernet 1000/100 Base-T1 to standard 1000Base-T/100Base-Tx Ethernet
- compact IP20 housing
- dedicated LEDs for transceiver and link status
- buttons for easy mode selection
- autolink function
- temperature range according to automotive standard
- RJ45 connector for standard Ethernet and Automotive Ethernet (adapter to D-Sub 9-pin included)

basic CON 4055

CAN FD stress and trigger module

- stress and trigger function for CAN and CAN FD
- frame trigger for SOF, ID, ESI, CRC DEL and error frames
- extended frame trigger for recessive bit in stuff bit count
- innovative, patent-pending frame filter
    - *automatic pass-through filter*
    - *blocking filter*
- injection of different disturbance types, such as time, interval or endurance disturbances
- output of the desired fault sequence via selectable transceivers
- configurable trigger output for external resources
- configurable via GAPI
- easy integration into user-specific solutions

LVDS

6222 Video Dragon

Generation and evaluation of video data

- capture and generation of video data on one device
- testing of display and/or camera systems with LVDS interface
- modular design consisting of base board and media interface
- easy adaptation to different serialisers/ deserialisers
- supports GMSL, FPD Link and APIX standards for image data
- sideband communication via UART, I^{2}C, SPI or MII, depending on the media interface
- configurable resolution depending on frame rate
- transmission of data streams (insertion into existing systems without influencing them)
- available as stand-alone box as well as PCIe and PXIe variants

*G-Patch-6222 variants available on request to adapt Video Dragon to the unit under test.

basic CON 4121 Video Dragon

Generation and evaluation of video data

- configurable as a frame grabber or frame generator
- broad spectrum of interchangeable serialiser/deserialiser types, e.g. for APIX 1/2, FPD Link I/II/III, HDMI, etc.
- integrated on-board processor with video co-processor
- FPGA for signal processing
- time stamp (real time clock) for data recording
- precise pixel comparison of different frames
- optional CAN FD interface for control of unit under test

Resistance simulation

basic CON · PXI 4009

Resistance simulator / resistor box

- general measurement and test systems
- simulation of resistors and potentiometers with centre tap
- resistors from 1 Ω to 1 M Ω
- ±1% accuracy
- max. load 0.5 W

# Compact systems

Communication systems

MagicCAR compact

Compact test platform for automotive control units

- compact, scalable automotive stand-alone platform with a focus on:
  - *Network compliance tests*
  - *Infotainment test*
  - *Customer-specific function and quality tests*
- internal Ethernet architecture based on GÖPEL electronic standard products
- programmable power supply and integrated current measurement
- supports CAN FD, LIN, FlexRay, Automotive Ethernet and K-Line
- supports infotainment interfaces such a MOST and LVDS e. g. APIX, GMSL and FPD-Link
- stress and disturbance functions for CAN FD and FlexRay
- connectors for additional external hardware (e.g. oscilloscopes, loggers, multimeters)
- interactive display for user and system information

Network tester

GÖPEL electronic has specialised in the area of network testing systems for automotive control devices for many years and is the leading provider of network testers. This years of experience have lead to the creation of a modular and OEM-independent system, which can be used across bus-systems and has a focus on CAN, CAN FD, LIN, Ethernet and FlexRay. The system enables use to determine the physical characteristics of the interfaces, verify communication characteristics and simulate transmission errors for in-vehicle networks. The combination of measurement technology and diagnostic functions within the network test system allow special network tests to be realised. Until now, these were often complex and could not be carried out in an automated way.
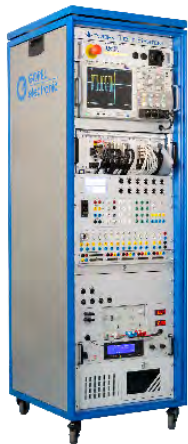
Powerful network tester for in-vehiclce networks

- bus systems: CAN FD, LIN, FlexRay, Ethernet
- dual 66 V/110 A power supply
- digital multimeter for voltage and resistance measurement
- current/voltage recording
- synchronized timestamp
- cross-interface trigger mechanism
- stress and trigger modules
- digital/analogue inputs and outputs
- relay matrix for all data sources/sinks
- voltage curves and offset

MagicCAR compact NET

Compact test platform for automotive control units

- modular, compact network tester
- bus systems: CAN FD, LIN, FlexRay, Ethernet
- power supply 30 V/8 A
- current/voltage recording
- expandable with external measuring devices
- synchronized timestamp/trigger mechanism
- stress and trigger modules
- flexible relay matrix

Sample Point System
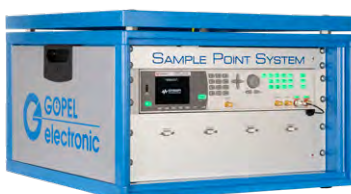
Measurement system for determining the sampling time for CAN/CAN FD. The box is an optional add-on for the standard GÖPEL electronic network test system.

- patented collision-tolerant procedure
- measurement of the sample point for CAN/CAN FD (arbitration and data phase)
- ±1% accuracy

Sound Checker ™

Acoustic analysis

- areas of use:
  - *affordable analysis of structure-borne and airborne noise*
  - *detection of interfering noises and assembly errors in mechanical systems via frequency analysis*
  - *for laboratory and end-of-line solutions*
- supported sensors:
  - *various structure-borne noise sensors*
  - *all common types of industrial microphones*
- with optional AI connection interfaces

*overview of accessories available on request.

CARoLINE

Acoustic tester

- ideal for use during development, prototyping and series production in end-of-line (EoL) testing
- synchronised recording of up to eight acoustic measurement channels
- I/O resources for triggering, gate control and synchronisation
- standard interfaces for integration into complex production lines/end-of-line test systems
- extensive visualisation and analysis functions with optional AI connection
- listen-in option of the acoustic data recording using headphones

*overview of accessories available on request.

System solutions
Haptic testers

No life without tactile sense! As early as the development of life on Earth, single-cell organisms had receptors that equate to a kind of sense of touch. There are up to 600 million tactile receptors in the human body, which play a key role in determining our sensation of our surroundings.

In addition to the actual functions, it is obvious to test these product properties. For this purpose, we offer test solutions from evaluation and small series to high-throughput EoL systems.

Haptik EK

Compact stand-alone system with one measuring section

- xy table for positioning
- 15 mm z-axis travel with force and displacement measurement
- intuitive user interface for parameterisation of test points and force-controlled slide movements
- automatic curve sketching for button and touch inputs
- pass/fail evaluation based on definable limits
- Raw data logging
- force/displacement measurement for switch-point determination, expandedable with additional analogue, digital and bus channels
- optional measurement technology for electrical function test with reaction-free of sleep current

Haptik IA

Integration into production lines

- single or multi-station systems
- for integration into a production line
- 15 mm z-axis travel with force and displacement measurement
- automatic curve sketching for communication of button and touch inputs
- pass/fail evaluation based on definable limits
- Raw data logging
- diverse database and traceability interfaces
- force/displacement measurement for switch-point determination, expandedable with additional analogue, digital and bus channels

Electric motor testing systems

Electric motors and drives go a long way from development, to first prototypes, to series production. It is therefore particularly important to detect any faults or weaknesses in the product as early as possible. CARMEN offers a wide range of static and dynamic test methods for DC motors. Detailed tests on the characteristic test bench in the laboratory or long-term tests under climatic conditions ensure that electric motors are thoroughly tested and transferred to series production in high quality.

CARMEN RD one Track

Characteristic curve test bench for DC motors

- check of quality-determining features for electric motors under realistic working conditions
- measurement of electrical and mechanical parameters
- ideal for use during development and testing
- configurable to customer specifications
- active load up to 100 Nm and 9000 rpm
- special high-current switching and measurement technology

CARMEN RD multi Track

Characteristic curve test bench for DC motors of different power classes

- up to three measurement sections adapted to the performance class of the unit under test in one system
- check of quality-determining features for electric motors under realistic working conditions
- measurement of electrical and mechanical parameters
- ideal for use during development, testing and series production
- configurable to customer specifications
- active load up to 100 Nm and 9000 rpm
- special high-current switching and measurement technology

CARMEN continuous operation systems are designed in such a way that a seamless and time-synchronous recording of all measurement data over a long period of time is guaranteed and subsequent analysis is possible. To decrease testing time, several units usually have to be tested at the same time in continuous operation. CARMEN therefore controls up to 4 several measurement channels in parallel and logs the results.

CARMEN DL Continuous Operation

Continuous operation test bench for DC motors with or without load unit

- recording of electrical and mechanical parameters
- configurable to customer specifications
- special high-current switching and measurement technology
- connection to climatic chamber for simulation of environmental conditions
- possible integration in climatic chamber for simulation of environmental conditions

Preventing early failures due to thermal and electrical stress complies with the latest quality requirements of the automotive industry and thus forms the basis for the geographical unrestricted use of vehicles. Vehicle components are operated under cyclically changing environmental scenarios in combination with real loads.

As these tests are usually carried out during production for start-up series, random samples or complete series, there are also special challenges for handling, contacting and parallel processing.

- ideal for usw during development, testing and series production
- configurable for 12V, 24V and high voltage applications
- can be combined with different environmental simulation environments (e.g. climate, dust/dirt, vibration, shock)
- simultaneous control of several units under test
- continuous detection of standby and operating current/voltage
- configurable data logging over the entire run time
- connection to MES and database systems possible

Seat test systems

The OsCAR function test platform is a system family for in-line quality testing of interior components in automotive construction, such as vehicle seats, door boards, roofing or individual components. The system is primarily designed for EoL testing of vehicle seats. It supports the testing of the following quality characteristics or components:

Electronics (testing/ configuration of control units, etc.)
- *diagnostics and parameterisation of control units via CAN and LIN bus*
- *full support for secured vehicle communication such as SecOC*
- *standardisation of movement path to specific positions*

Mechanics (force/pressure/flow)
- *seat occupancy sensors*
- *seat ventilation*

Pneumatics
- *lumbar support*
- *massage bladder*
- *dynamic driving systems*

Optics (distance/brightness/colour, etc.)
- *seat position detection*
- *contour measurement*
- *symbol recognition*

Electrics (voltage/current/resistance)
- *airbag*
- *seatbelt tensioner*
- *buckle*
- *seat occupancy sensors*
- *heater*
- *footwell light*
- *travel*

Configuration overview: OsCAR

	OsCAR advanced G4	OsCAR smart G4	OsCAR nano
protection Level	IP54	IP54	without
housing option	fan or air conditioning	fan or air conditioning	without
UPS	available	available	without
controller (communication with accessories)	IPC	IPC	PLC (without IPC)
basis of measurement	DMM	DMM	measuring clamp
seats	standard: 1 channel variant, parallel measurement with 2-channel option (1 seat per channel)	max. 1 seat possible	max. 1 seat possible
supply of unit under test	available	available	optional
scalability	project-bound, expandable, scalable	project-bound	project-bound
covered by system:			
electrics (current, voltage, resistance)	yes	yes	yes
communication (CAN, LIN, SecOC)	yes	yes	no
variables measured by accessories:			
optics (distance)	lasers	lasers	n/a
contour measurement (lordosis, massage, mirror, side panel activities)	LaRS	LaRS	n/a
seat occupancy test (ODS)	FAM	FAM	n/a
testing of open pneumatic components	AirModule smart	AirModule smart	n/a
additional accessories:			
operating the switch panel	Coby (Cobot)	Coby (Cobot)	n/a

OsCAR advanced G4

- ideal for use during development, testing and series production
- modular and scalable EOL testing platform
- configurable to customer specifications
- intuitive operating concept
- high test coverage
- mechanical and electrical function test
- pneumatic test
- optical test/contour measurement
- protection class IP54 – external IP54-protected signal allocation unit (SAU) for customer-specific testing configuration
- various seat classes can be combined in one production line - one test system for all seat types
- independent, parallel testing of two seats – double tester

OsCAR smart G4

- ideal for use during development, testing and series production
- modular and scalable EOL testing platform
- configurable to customer specifications
- intuitive operating concept
- high test coverage
- mechanical and electrical function test
- optical test/contour measurement
- available as a 1-channel solution
- can be used as a desktop solution
- compact design, only 10U

OsCAR nano G4

- use in development, testing and series production
- modular and scalable EOL testing platform
- configurable to customer specifications
- intuitive operating concept

OsCAR Force Application Machine (FAM)

The seat occupancy is checked by simulating various occupancy states. Depending on the type of ODS, the simulation can be performed by applying a force or by capacitive influence of the electrical field.

The following is an overview of the structure of the functional design of the FAM models. The design is modularised and configured or adapted on the basis of customer-specific requirements.

*Image representation of FAM 1000 here

Configuration Overview: FAM

Level of freedom		System properties
static	FAM 400	testing of single seats, pairs of seats or rear bench seats without variations
		compact
		high precision
		stand-alone test bench
		no access
		system scalable up to three z-axes
		400 mm stroke length
	FAM 1000	testing of single seats, pairs of seats or rear bench seats without variations
		compact
		high precision
		stand-alone test bench
		access by moving upwards
		system scalable up to three z-axes
		1000 mm stroke length
dynamic	manual 2-axis system	LH/RH test
		access by moving upwards
		access through manual positioning
		manual operation
	electric 2-axis system	sequential LH/RH test
		automated test procedure
		access by moving upwards
	pneumatic 2-axis system	LH/RH test
		no access
		compact
		stand-alone test bench
	electrical 3-axis system	sequential LH/RH test with variation
		automated test procedure
		high stability due to short z-axis
		maximum flexibility

Cobot

Many monotonous, recurring, manual activities can be completed with a cobot to significantly increase the degree of automation. Coby complements the OsCAR test system and can also be integrated into test systems from other suppliers.

• the following tasks can be automated:
    • *constant force actuation of buttons (lordosis, massage, seat adjustment switch)*
    • *adjustment of electric and manual seats to all end points*
    • *application on occupancy detection tools (e.g. Body Sense, SBR weight)*
    • *insertion and detachment of belt buckle*

*GÖPEL electronic takes care of all steps for integration into your production and test environment.

As experienced specialists in automotive electronics, we support you in your developments in the field of electric vehicles. Our testing systems and solutions are tailored to your specific requirements, both for prototypes and series production.

GÖPEL Electronic Test Solutions for Electromobility:
- Powertrain - power supply and battery in high-voltage range (400 - 800 V)
- Interior - dashboard, instrumentation, seats, power windows, tailgate, etc.
- In-vehicle networks, LVDS applications and driver assistance systems

Powertrain Electric Vehicle

Test systems for Battery Junction Boxes and Battery Management Controllers (BMC)

Safety tests
- insulation and dielectric tests up to 4500 V DC
- insulation test above 10 MOhm

Function test
- voltage range up to 1000 V DC
- current range up to 800 A DC
- battery simulation 800 V DC up to 30 kW
- 1400µF capacitive load as load connection
- switching matrix for insulation test
- rest bus simulation over all vehicle bus systems
- crash shutdown simulation

Calibration function
- current comparison +/- 1 A to +/- 600 A with an accuracy of 0.002 %

Test systems for high-voltage batteries

Safety tests
- insulation tests up to 4500 V DC
- insulation test for over 10 MOhm

Function test
- voltage range up to 1000 V DC
- current range up to 800 A DC
- battery charging and discharging
- power pulse test
- equipotential bonding measurements
- crash shutdown simulation
- HV Interlock test
- Insulation monitoring device test
- voltage measurement
- verify state of charge (SOC)

Infotainment test for automotive applications
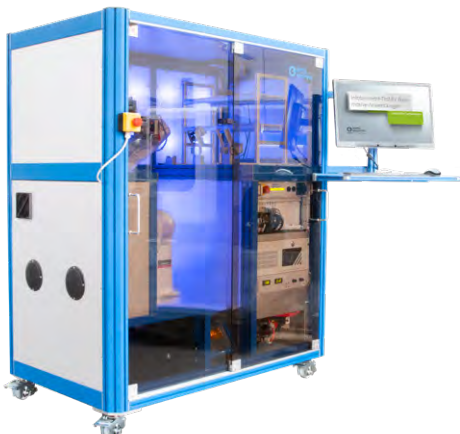
Multimedia interfaces are complex operating and display devices for functions such as entertainment, handsfree communication trip computer and vehicle settings. Function testing of such complex control units and their interfaces with in-vehicle networks pose a particular challenge in every phase of the product development process.
The variety of communication interfaces and the diverse nature of the controls require modular testing equipment, not least for reasons of cost. The interplay of different test technologies creates a powerful and cost-optimised test system for various infotainment assemblies.

Software

Net2Run Configurator
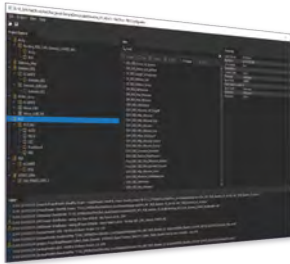
Creation of restbus simulations

- efficient tool for creating complex restbus simulations for heterogeneous vehicle networks
- supports automotive bus systems CAN/CAN FD, LIN, FlexRay and Ethernet based on signals and PDUs in accordance with AUTOSAR
- configuration based on vehicle databases (*.dbc, *.ldf, *.xml, *.arxml)
- enables easy routing of signals or complete PDUs between buses (gateway function) and simple rest bus simulations on individual bus systems
- user-friendly user interface offers numerous functions for working with conventional signals and special signals such as counters, checksums, E2E protection and secure on-board communication (SecOC)
- supports Series 61 and Series 62 communication controllers

Net2Run IDE
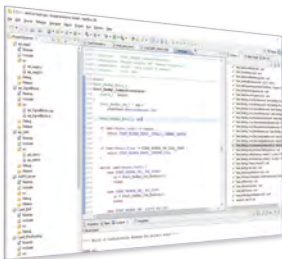
Creation of on-board programs)

- enabled users to run own user applications directly on devices from GÖPEL electronic
- fully fledged C/C++ development environment in which the user can develop, edit, debug and execute on-board programs
- the GÖPEL API – familiar from Series 61 integration in Windows programs – is available as an on-board API
- simplifies the creation of on-board programs
- supports Series 61 devices

Dragon Suite Advanced

- free-based expansion of features and functions for Dragon Suite
- script interface: a powerful and flexible tool for creating, storing and executing complex procedures
- extremely comprehensive initialisation sequences can be started at the push of a button and made available to other users
- supports CAN over UART on Video Dragon devices

additional Dragon Suite Advanced features include:
- sideband communication monitoring
- support of a wide range of image formats in the Live View window
- Raw data recording (multi-channel streaming with time stamps and meta-information)
- convenient editing functions for defining and issuing test patterns

Enjoy Testing

GÖPEL electronic GmbH

GÖPEL electronic *Enjoy Testing*

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