G6 Multi Channel Force Instrument

Program version 3.1.x

Technical Manual

Type RM

BLH NOBEL
A VPG Brand

PRECAUTIONS

Read this manual BEFORE operating or servicing this instrument. The manual helps you use the instrument safely and efficiently. Follow the instructions provided here and in the following chapters. Save this manual for future reference.

Only permit qualified personnel to install and service this instrument. Exercise care when making checks, tests and adjustments that must be made with power on. Failing to observe these precautions can result in bodily harm.

DO NOT allow untrained personnel to operate, clean, perform service, or in any other way handle this instrument.

Meaning of symbols in this manual and on the product

Direct current

Caution, risk of danger. Documentation needs to be consulted

Ground terminal

WARNING Warning text that points out a risk or danger that you need to be aware of

INTENDED USE

General

The G6 instrument is a multi-channel measuring and control device intended for industrial use. Its basic function is to convert signals from transducers to useful information. Transducer excitation is included as well as parameter controlled signal processing, indication of output levels, error supervision and operation of optional external equipment.

The instrument is modular and can be equipped with different types of I/O units. There are transducer interface modules, digital and analog input/output modules. The instrument supports several types of communication interfaces.

CE considerations

The instrument is classified as class A group 1 equipment. This means that the instrument:

* is not designed to intentionally generate and/or use radio frequency energy; and

* is intended for use in environment other than domestic or environment sharing low voltage power supply network with residential environment.

> ***WARNING***
>
> *This product may cause interference if used in residential environment. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts. This can, for instance, be done by keeping a distance of at least 10 m between this product and any sensitive radio equipment.*
> *Note, however, that this product can be directly connected to a domestic low voltage power supply network without any special measures.*

FCC considerations

The instrument is classified as class A digital device, according to the US Federal Regulations.

> ***NOTE***
>
> *This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

Contents

1. Introduction

General 1-1
Functions 1-2
Safety information 1-4
Maintenance 1-4
Technical data 1-5
Ordering information 1-13

2. Installation

Mechanical installation 2-1
Electrical installation 2-2
CPU 2-3
VIEWPAN 2-5
WFIN, WFIN2 and HSWF2 2-6
AOUT1 and AOUT4 2-9
DIO8 2-10
Profibus-DP Fieldbus Adaptor 2-11
DeviceNet Fieldbus Adaptor 2-13
PROFINET Fieldbus Adaptor 2-15

3. Instrument Functionality

General 3-1
Function Block 3-1

4. Set-up

General 4-1
Operator interface 4-2
Menu structure 4-6
Parameters 4-8
Program options 4-36

5. Calibration

General 5-1
Common parameters 5-2
Calibration using datasheet 5-3
Using parameters values from a previous calibration 5-4
Calibration with known forces 5-5

6. Operation

General 6-1
Power supply 6-1
Power-up sequence 6-1
Operating display 6-2
Security locks 6-3
Zero setting 6-3
Main menu 6-4
Level supervision 6-5
Use of inputs and outputs 6-6
Filter function 6-7

7. Communication

General 7-1
Serial interface 7-1
Modbus RTU slave 7-1
Modbus TCP slave 7-2
Ethernet/IP 7-2
Ftp server and file handling 7-3
Modbus protocol 7-3
Fieldbus interface 7-28
Fieldbus data definitions 7-32

8. Remote Access

General 8-1
Browser requirements 8-1
Using the Remote Access 8-1
Security 8-2
Remote Access Login and Logout 8-3
Remote / Local Access 8-5
Remote Set-up 8-5
Remote Access Maintenance 8-9
Live View 8-18

9. Maintenance

General 9-1
Diagnostics 9-1
File Handling 9-4
Create Backup 9-5
Restore Backup 9-5
Set Default 9-5
Program Upgrade 9-5
Instrument Restart 9-6

10. Troubleshooting

General 10-1
Error codes 10-1

1. Introduction

General

The G6 Instrument is a high performance multi-channel force indicator intended for industrial systems.
Its basic function is to convert the signals from strain gauge transducers to useful force information. Transducer excitation is included as well as parameter controlled signal processing, indication of output levels, error supervision and operation of optional external equipment. The instrument can be equipped with up to six synchronized force channels.

The instrument is modular and can be equipped with different types of **I/O units** to match the demands in the specific applications. There are strain gauge transducer interface modules, a digital input/output module, analog output modules.
Internal solid-state outputs in the instrument can be used for output functions from level supervision or 'In process' indication, reporting the operating status of the G6 Instrument.

The **CPU unit** in the instrument has several communication interfaces. It has a serial communication port, an Ethernet port, a USB port and a fieldbus slot.
Several G6 Instruments can be controlled from a master computer or PLC.
Serial communication interface is RS485 using Modbus RTU protocol. The Ethernet interface is using Modbus TCP or (optional) EtherNet/IP and the optional fieldbus interface uses PROFIBUS, DeviceNet or PROFINET.

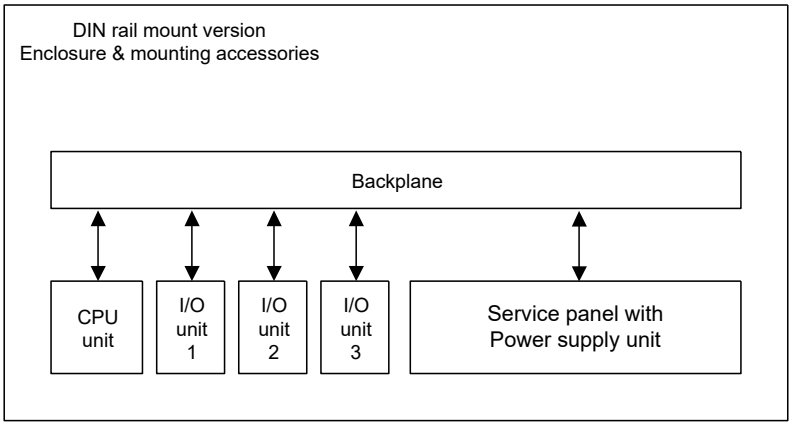
EtherNet/IP communication is enabled by entering a program option code in the set-up. The option code can be purchased from your supplier.

It is possible to access the instrument, set-up and maintenance functions, remotely over the Ethernet connection using a Web Browser on a connected PC.

It is possible to load new software into the instrument using the USB port.

All functions in the G6 Instrument are controlled by set-up parameters. Setting of parameter values can be performed via a **service panel with display and 4 keys** (VIEWPAN module).

The Rail mount instrument type is powered with 24 V DC. All input and output signals are galvanically isolated from the power supply by operational insulation.



Block structure of a G6 RM Instrument

Functions

Measurement with strain gauge transducers
Both excitation voltage and output signal are measured at the transducer to avoid influence from voltage drop in the connection cable. Excitation to the transducer, from the G6 Instrument is provided over separate wires.

A/D conversion
The analog signals from the transducer are converted to digital form and filtered to give an internal transducer signal with high resolution.

Calculation
The transducer excitation and signal values are combined to form an internal transducer signal, representing the load on the transducer. Influenced by calibration data, this signal is converted to a digital measurement value, the force value, which can be presented at the local display window and at external equipment.

Error supervision
As long as the error supervision detects no error, the signal ‘In process’ is present but if an error is detected, ‘In process’ will be off and a specific error message will be displayed. ‘In process’ can be set to control any digital output. Note that there are force channel specific and instrument specific error detection.

Levels
32 level comparators in the instrument can be set to switch at defined signal levels with any selected hysteresis added, meaning that the switch level can be different for increasing and decreasing signal. It’s possible to set level switching delays. Output signals from these comparators are available on the serial communication. The level comparator outputs can also be set to control digital outputs from the instrument.

Communication
The G6 Instrument utilizes the serial interface, Ethernet and a fieldbus interface for communication with control computer. The serial interface consists of a RS485/RS422 connection that can be used with 2- or 4-wire connection.
Force values, web tension values, level status, error status etc. can be collected and commands given through the communication interfaces. Modbus RTU protocol is used for the serial interface and Modbus TCP and EtherNet/IP for the Ethernet connection. For the optional fieldbus interface Profibus, DeviceNet or PROFINET can be used.

Instrument modes
In normal operation mode the G6 Instrument is presenting the measurement values on the front panel (VIEWPAN) alphanumerical display. Values for one Function Block at a time can be shown.
During parameter set-up the instrument will continue normal operation. However, if hardware set-up parameters have been changed the instrument will be restarted. The operator will always be notified before the instrument is restarted.

Parameter setting
In the instrument all operating functions are controlled by set-up parameters with numerical values, string values, or pre-selected values from a list of alternatives. Parameter set-up is performed by the keys at the service panel (VIEWPAN).

Presentation
The instrument can present measured or calculated values, parameter settings etc. at the front panel. An extensive system of menus gives the possibility to present various information about the instrument. The VIEWPAN module can present one or two values at a time.

Measured or calculated values, status of levels and so on, can be transferred to external equipment via the different communication interfaces (some are optional).

Ethernet/IP program option
Ethernet/IP is accessed by enabling a program options. This optional interface is intended for accessing force values, web tension values, level status, error status etc.and send commands. The interface is not intended for set-up of the instrument.

Remote Access
It is possible to access the instrument through the Ethernet connection. Using a Web Browser on the connected PC most set-up and maintenance functions are available on the PC. This possibility will simplify commissioning and service. It will make it possible to access instruments from outside the local network (internet) providing the network allow this.

Safety information

Before connecting power to the instrument, check that all fixation screws of the modules are tightened so that the functional grounding of the instrument by the housing is obtained.

The instrument may only be utilized for the measurement and control functions, described in this Technical Manual. It is especially important to adhere to the load limits of the input/output connectors. We accept no responsibility for any damage arising from improper operation.

Any changes to the instrument, which cause any function changes, may only be carried out by the manufacturer, or after discussion with and permission by the manufacturer.

Maintenance

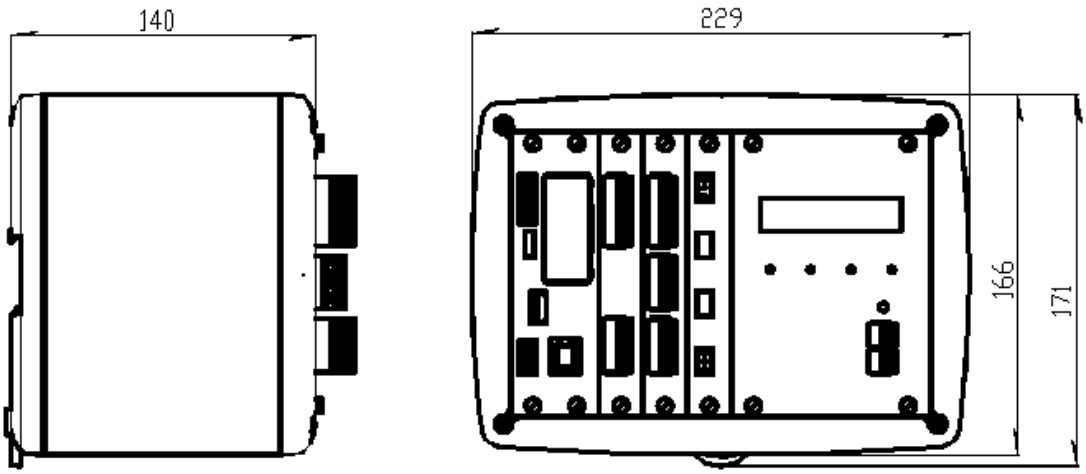
The G6 instrument needs no maintenance, performed by the end-user. Any service or repair work must be performed by qualified personnel.
Contact your supplier.

Before cleaning the G6 instrument, make sure to disconnect from the external power source. Use a soft cloth to clean the exterior of the instrument.

This product contains a built-in lithium coin cell battery (CR2025) used for the clock function. The battery is easily accessible and located on the circuit board of the CPU-module. During disassembly or replacement, the battery must be removed by authorized service personnel and handed over to an approved recycling operator. For more information, refer to the national collection system. If in doubt, contact your supplier for further guidance.

Technical data

Mounting	DIN rail mount (RM)
Enclosure	Aluminium housing with plastic frames
Dimensions	See figure on the next page
Rail mount	DIN 46 277/3 and DIN EN 50022 (w=35 mm, h=7.5 mm)
Display, keyboard	See section “VIEWPAN” for details
Temperature range	Rated performance: -10 to +50 °C Storage, transport: -25 to +85 °C
Relative humidity	Max. 85% up to 40 °C, decreasing linear to 50% at 50 °C
Rated pollution	Pollution degree 2
Degree of protection	IP20. For indoor use
Altitude	Up to 2000 m
EMC	Class A group 1 equipment, industrial electromagnetic environment (acc. to EN 61326-1 and IEC 61326-1). Class A digital device (acc. to 47 CFR part 15)
Compliance	CE, FCC



Overall dimensions of the instrument

VIEWPAN

Module type	Display/keypad interface with integrated power supply for the complete instrument
Input voltage	24 V⎓ ±15% including fluctuations, 40W
Output voltage	24 V⎓ output 0.1 A The same voltage as input voltage
Display	2 x 16 character LCD with backlight
Keyboard	4 keys

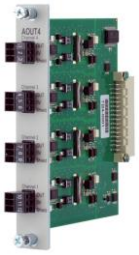
CPU

Module type	CPU module		
RTC backup battery	Lithium battery CR2025 3V	<u>Manufacturer</u> Panasonic Energizer FDK America	<u>Type</u> CR2025L/BN CR2025VP CR2025
Serial port (RS485)	For process data and control. Isolated by operational insulation		
Protocol	Modbus RTU		
Baud rate	Up to 115 kbaud		
Fieldbus	For process data and control (optional)		
Types	PROFIBUS, DeviceNet or PROFINET		
USB	Version 2.0		
Keyboard	USB keyboard for PC		
USB Memory	USB type for PC. For backup and restore of set-up parameters. For change to a new program version		
Ethernet	10/100/1000BASE-T. For process data, control, file transfer and remote access		
Protocol	Modbus TCP, EtherNet/IP, ftp, http		
RJ45 Indications	Green:1000BASE-T, Green&Yellow:100BASE-T, Yellow:10BASE-T. Flashing indicates activity		

WFIN, WFIN2	
Module type	Weight/force input module
Maximum number of transducers	8 (350 Ohm) per channel Maximum 48 transducers per instrument
Excitation voltage	5 VDC
A/D conversion	3.9 kHz, 16 000000 units (24 bits)
Input range	+/- 7 mV/V
Update rate	9.3 – 300 readings per second
Filtering	See section “Filter function” for details
Number of channels	WFIN has one weight/force channel WFIN2 has two weight/force channels
Sensitivity	0.1 μV
Zero drift	<10 nV/V/K
Span drift	<2 ppm/K
Digital I/O	4 inputs, 24 V ±15%, 5 mA from external power supply, isolated by operational insulation and with common return 2 outputs, 24 V ±15%, max 100 mA from external power supply, isolated by operational insulation and with common return

HSWF2	
Module type	High speed weight/force input module
Maximum number of transducers	4 (350 Ohm) per channel
Excitation voltage	10 VDC
A/D conversion	20 kHz, 16 000000 units (24 bits)
Input range	+/- 4.5 mV/V
Update rate	25 – 800 readings per second
Filtering	See section “Filter function” for details
Number of channels	HSWF2 has two weight/force channels, separately isolated by operational insulation
Sensitivity	0.1 μV
Zero drift	<10 nV/V/K
Span drift	<2 ppm/K
Digital I/O	4 inputs, 24 V ±15%, 5 mA from external power supply, isolated by operational insulation and with common return 2 outputs, 24 V ±15%, max 100 mA from external power supply, isolated by operational insulation and with common return

DIO8	
Module type	Digital input/output module
Separate I/O module	2 units can be used
Digital I/O	8 inputs, 24 V ±15%, 5 mA from external power supply, isolated by operational insulation and with common return 8 outputs, 24 V ±15%, max 100 mA from external power supply, isolated by operational insulation and with common return

AOUT1, AOUT4	
	
Module type	Analog output module
Number of channels	1 or 4 channels, separately isolated by operational insulation
Resolution	65000 units, 16 bits
Non-linearity	< 0.025% of range
Voltage output	0 – 10 V, -10 – 10 V; > 1 kOhm load
Current output	4 – 20 mA, 0 – 20 mA, -12 – 20 mA, -20 – 20 mA; < 500 Ohm load
Update rate	Function Block update rate, adjustable smoothing filter
EMI	At most 1% inaccuracy at 10 V/m radio-frequency electromagnetic field

PROFIBUS-DP	
Module type	PROFIBUS-DP fieldbus adaptor
Connector	PROFIBUS 9-pin, female D-sub (DB9F)
Baudrate	Auto setting 9.6 kbps – 12 Mbps
Address	1 – 125, set by parameter
Fieldbus data	16 bytes from fieldbus to instrument. 32 – 224 bytes from instrument to fieldbus (may be limited by the master). See chapter ‘Communication’, section ‘Fieldbus interface’ for details on fieldbus data mapping.
Mounting	The fieldbus adaptor is mounted through the front of the CPU module with LED’s and connector accessible through the CPU front panel. Remove the plastic cover from the fieldbus slot in the CPU module front panel. Insert the adaptor very carefully and make absolutely sure that the adaptor slides correctly into the guides in the connector on the CPU PCB. Tighten the two fastening screws at the adaptor front and check that the two securing hooks locks into the CPU PCB.
Settings	All fieldbus settings are done with setup parameters in the instrument. No settings are done on the module itself.

DeviceNet	
Module type	DeviceNet fieldbus adaptor
Connector	5 pin male connector.
Baudrate	125, 250, 500 kbps or Auto. Set by parameter.
Address	0 – 63, set by parameter
Fieldbus data	16 bytes from fieldbus to instrument. 32 – 224 bytes from instrument to fieldbus (may be limited by the master). See chapter ‘Communication’ section ‘Fieldbus interface’ for details on fieldbus data mapping.

Mounting	The fieldbus adaptor is mounted through the front of the CPU module with LED's and connector accessible through the CPU front panel. Remove the plastic cover from the fieldbus slot in the CPU module front panel. Insert the adaptor very carefully and make absolutely sure that the adaptor slides correctly into the guides in the connector on the CPU PCB. Tighten the two fastening screws at the adaptor front and check that the two securing hooks locks into the CPU PCB.
Settings	All fieldbus settings are done with setup parameters in the instrument. No settings are done on the module itself.
Bus supply voltage	According to the DeviceNet (Node) Specification: nominal 24 VDC, range 11 – 25 VDC

PROFINET	
Module type	PROFINET fieldbus adaptor
Connector	Ethernet RJ45
Fieldbus data	16 bytes from fieldbus to instrument. 32 – 224 bytes from instrument to fieldbus (may be limited by the master). See chapter 'Communication' section 'Fieldbus interface' for details on fieldbus data mapping.
Mounting	The fieldbus adaptor is mounted through the front of the CPU module with LED's and connector accessible through the CPU front panel. Remove the plastic cover from the fieldbus slot in the CPU module front panel. Insert the adaptor very carefully and make absolutely sure that the adaptor slides correctly into the guides in the connector on the CPU PCB. Tighten the two fastening screws at the adaptor front and check that the two securing hooks locks into the CPU PCB.
Settings	All network properties are set by the IO Controller. Data blocks are set in the instrument.

Ordering information

G6-RM-FB-S1-S2-S3-V-SW

G6	Instrument type		
RM	Enclosure type	RM	Rail mount
FB	Fieldbus interface	0 P D N	None PROFIBUS DeviceNet PROFINET
Si	Slot 1 to 3 type	0 2 3 4 6 7 8	Blank HSWF2 High speed weight/force input module, 2 chan. WFIN Weight/force input module, 1 channel WFIN2 Weight/force input module, 2 channels AOUT1 Analog output module, 1 channel AOUT4 Analog output module, 4 channels DIO8 Digital input and output module, 8 channels
V	User interface and power	V	VIEWPAN module
SW	Software	W F S	Standard Weighing Program Standard Force Program Special Program (see note 1 below)

Example: G6-RM-0-4-8-0-V-F

- *G6 instrument (G6)*
- *Rail mount (RM)*
- *No field bus (0)*
- *Slot 1 = WFIN2 (4)*
- *Slot 2 = DIO8 (8)*
- *Slot 3 = Blank (0)*
- *Power =VIEWPAN unit (V)*
- *Software = Force program (F)*

Note 1: If a special program option is desired, the designation of the special program must be specified when ordering.

Separate modules

Spec.no	**Module type**	**Module name**
110964	CPU	CPU unit
111162	HSWF2	High speed dual Weight/Force input module
111171	WFIN	Single Weight/Force input module
111174	WFIN2	Dual Weight/Force input module
111168	AOUT1	Single channel analog output module
111165	AOUT4	Four channel analog output module
111177	DIO8	Digital input/output module
111189	BLANK	Blank panel
111186	VIEWPAN	Rail mount service panel
110559	PROFIBUS-DP	PROFIBUS DP fieldbus adaptor
110560	DEVICENET	DeviceNet fieldbus adaptor
110858	PROFINET	PROFINET fieldbus adaptor

Module selection rules

Every system needs one VIEWPAN module and one CPU module (can be equipped with one fieldbus adaptor).

Limitations on number of I/O modules that can be used in one instrument:

- maximum three modules (not counting the VIEWPAN module);
- maximum three WFIN(2) or three HSWF2 modules;
- HSWF2 and WFIN(2) module types cannot be mixed in the same system;
- maximum one AOUT1 or one AOUT4 module;
- maximum two DIO8 modules.

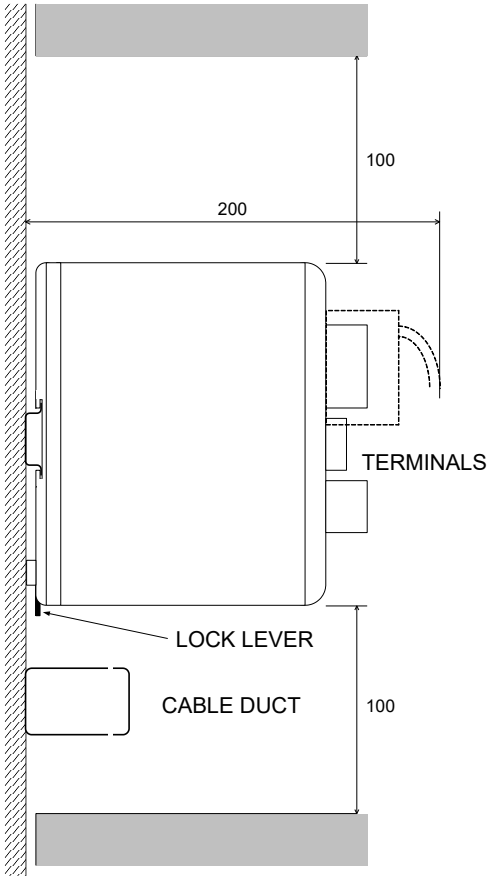
2. Installation

Mechanical installation

See chapter “Introduction – Technical data” for references to RM mechanical measures.

G6, RM type, should be used in a dry, clean environment or it must be mounted in a cabinet, protecting from water, dust etc. The instrument is prepared for mounting on a flat surface by DIN rail according to “Technical data”. The instrument needs minimum 200 mm space above this surface. To remove the instrument from the rail, the black lever at the lower bottom side of the instrument must be engaged.
Each instrument should have a free space of minimum 30 mm to the left and to right, 100 mm above and below the instrument. Cable ducts may be mounted in this free space.

All electrical connections to the instrument modules are made to terminals at the front side so enough room for these terminals should be arranged.



RM instrument. Recommended free space at the instrument

Electrical installation

The field wiring of the instrument shall be suitable to the environment (e.g. chemically) in the end-user application.

Field wiring installation shall comply with any national regulations, hereunder National Electrical Code (NEC) for US and/or Canadian Electrical Code for Canada.

This instrument is classified as permanently connected equipment.

A switch or circuit-breaker shall be included in the building installation. The switch shall be in close proximity to the equipment and within easy reach of the operator. The switch shall be marked as the disconnecting device for the equipment.
The equipment switch or circuit-breaker employed as disconnecting device shall comply with relevant requirements of IEC 60947-1 and IEC 60947-3 and be suitable for the application.

The power supply for the instrument should be made via an external DC source (for details see page 2-5).
For all the interfaces, except for the power input, shielded cables must be used.
It is recommended to route all the other cabling away from power cables in order to avoid the risk for electromagnetic interference.

WARNING

Make sure that that the power to the instrument is turned off before:
- any modules are removed from or inserted in the instrument;
- any connections are connected to or disconnected from the instrument.
All modules should be regarded as ESD sensitive. Make sure that an ESD safe environment is maintained when inserting modules, removing modules and when handling modules separately from the instrument. The modules must be kept in metalized ESD bag when not mounted in the instrument.

CPU

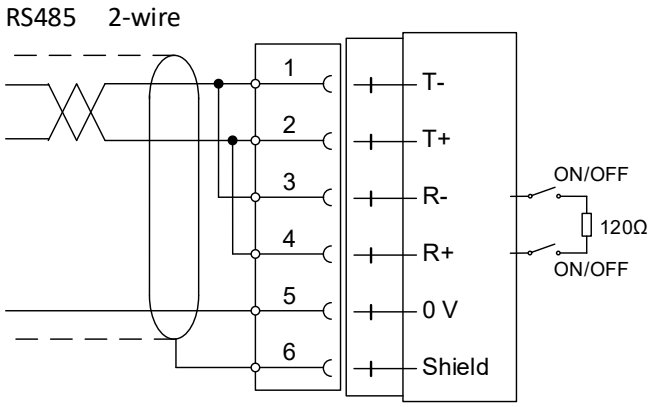
The CPU module includes an internal battery of lithium type. It is used as a backup battery to the RTC clock. Replacement of the battery shall only be done by a trained technician. For battery alternatives, see “Technical data”.

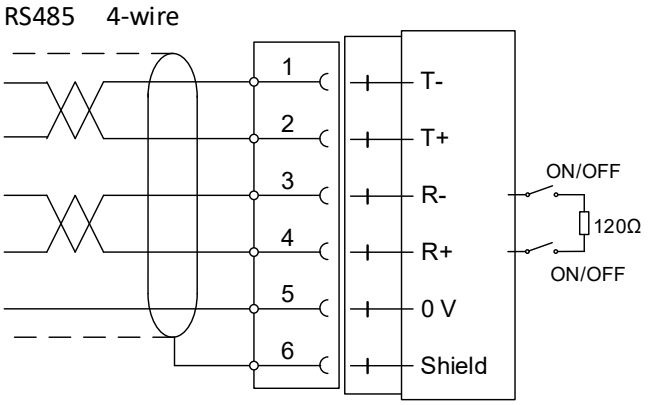
Serial port

RS485 serial communication for wire or 4-wire with common 0 V. This is a SELV circuit.

The port can be used for serial communication to computer/PLC (Modbus RTU). Connections are made to terminals 1 – 5. Shielded cable must be used. Connect shield to terminal 6.

The communication lines must be terminated in both ends. If G6 is connected at the end of the communication line, termination for the receiver can be set to ‘ON’ for the parameter ‘Receiver termination’ in the menu ‘Serial Com.’. There is no termination for the transmitter in the instrument.





Fieldbus

Slot for optional Fieldbus interface.

PROFIBUS DP-V1, DeviceNet and PROFINET are available. See section on fieldbus adaptors later in this chapter for details.

USB

Connector for USB device(s).

This port has no operational insulation and should be considered as a SELV circuit.

The length of the cable connected to the USB port must not exceed 3 m.

By using a USB Hub, connection of more than one device can be allowed.

Ethernet

This is a SELV circuit. A shielded cable must be used.

The Ethernet cable category is chosen depending on the maximum data rate for the end-user specific installation.

VIEWPAN

VIEWPAN module has an integrated 24 V⎓ power supply unit, used to supply the complete instrument.

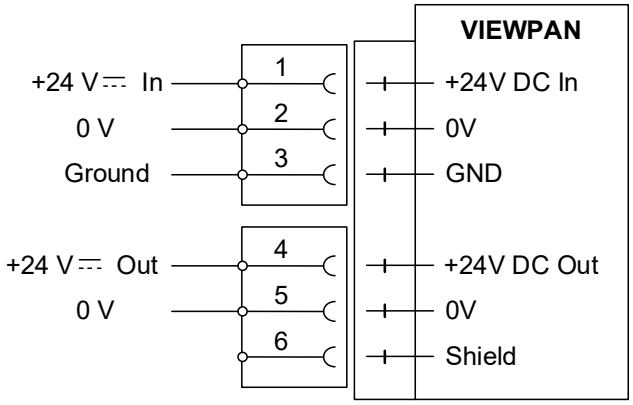
The output of the external DC source must be rated 24 V ⎓, ±15% including fluctuations, min. 40W. The DC source must provide Double Insulation between Mains parts and 24V SELV circuit,
and a limited-energy circuit (maximum available current of 8A).
For the US market this energy limit can be achieved with an ANSI/UL248-14 fuse rated 5A.For other markets an IEC 60127 T type fuse rated 4A may also be used.

24 V DC In

Terminals 1, 2 and 3.
The G6 instrument should be powered by 24 V⎓ and connected according to the diagram below.
Terminal 3 must be connected to ground. The connection is required to achieve functional grounding.
See “Technical data” for input voltage ratings.

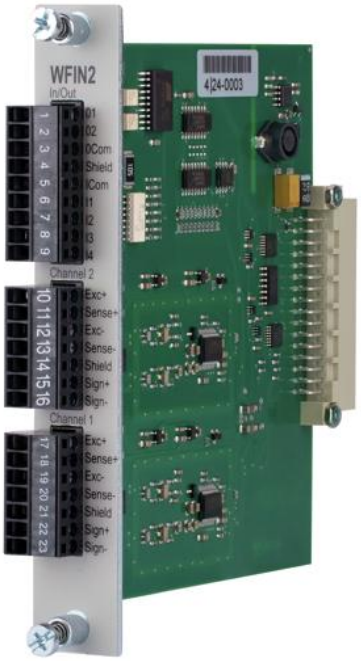
24 V DC Out

Terminals 4 and 5 can be used to supply max. 100 mA to digital inputs and outputs.
Connect according to the diagram below.
See “Technical data” for ratings.



WFIN, WFIN2 and HSWF2

The voltage levels on connectors of I/O modules shall not exceed voltage levels of 30 Vrms, 42.4 Vpeak or 60 Vdc under normal conditions.
In wet locations these voltage levels shall not exceed 16 Vrms, 22.6 Vpeak or 35 Vdc.



Transducer inputs

Terminals 17 – 23 (channel 1), 10 – 16 (channel 2). Transducer connection should be handled with great care to achieve good measuring data. Transducer integrated cables may not be shortened. Shielded cables must be used. There are no limitations on the cable length as long as it is possible to ensure proper measuring function.

> ***WARNING***
>
> *Transducer cables must be routed at least 200 mm away from 110-240 V, 50/60 Hz power cables. For power cables carrying other frequencies or high power, an even wider distance is preferable.*

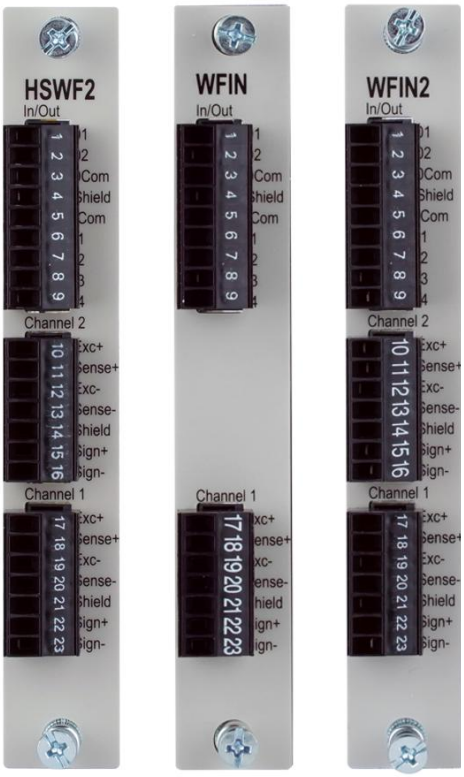
4-wire connection can be used if the transducer integrated cable is long enough to be connected directly to a transducer input. At 4-wire connection, some terminals must be interconnected as shown in figure on the next page.

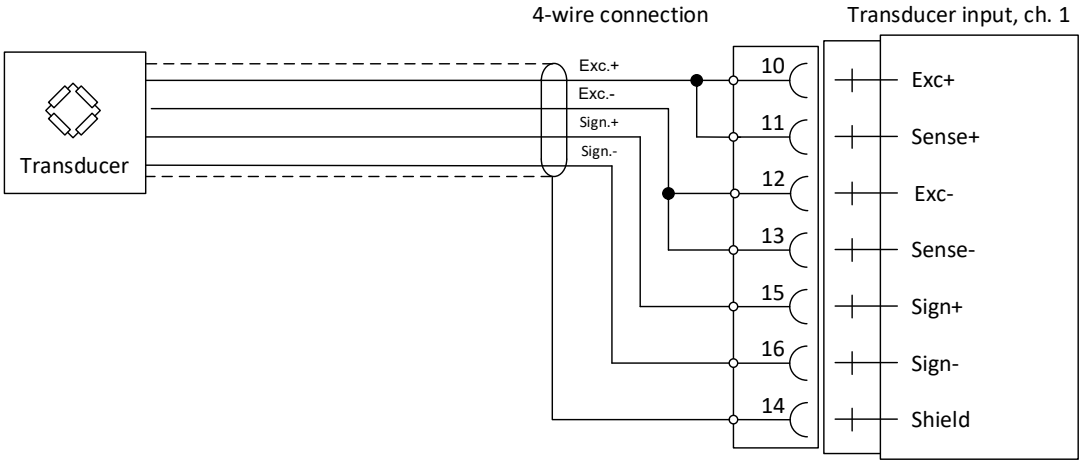
6-wire connection should be used if the integrated cable must be lengthened or if several transducers should be connected to one transducer input.

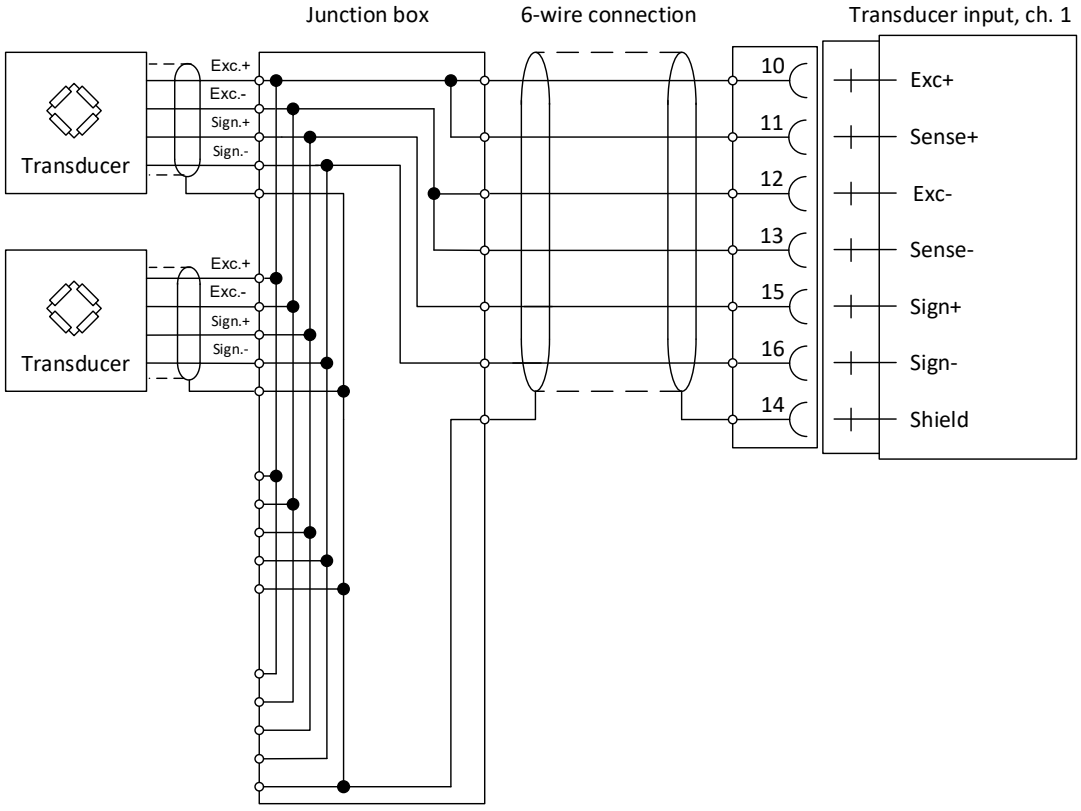
The channel 1 cable shield must be connected to terminal 21 and the channel 2 cable shield must be connected to terminal 14.

In WFIN and WFIN2 the shield terminals are internally connected to the G6 housing, which is internally connected to ground via the power supply connector pin 3. The shield shall not be connected at any other point.

In HSWF2 the transducer input channels are separately isolated by operational insulation and the shields can be connected to the most convenient ground/earth point. This can be the junction box when using multiple transducers or at the barrier ground when using Ex Zener barriers.







A transducer may be connected directly to terminals at the transducer input.
For several transducers or long distance, a junction box
and lengthening cable is needed.
For a HSWF2 channel, the shield can be connected to
ground/earth at any point

Digital inputs

Terminals 6 – 9 and terminal 5 (ICom) as a common connection.

Four digital inputs are provided, with functions that can be set in the G6 set-up. External sourcing (24 V⎓) from the instrument power supply (max. 100 mA) or from a separate DC supply must be used. Note that either the positive or the negative pole of the voltage source (24 V⎓) can be connected to ICom (5).

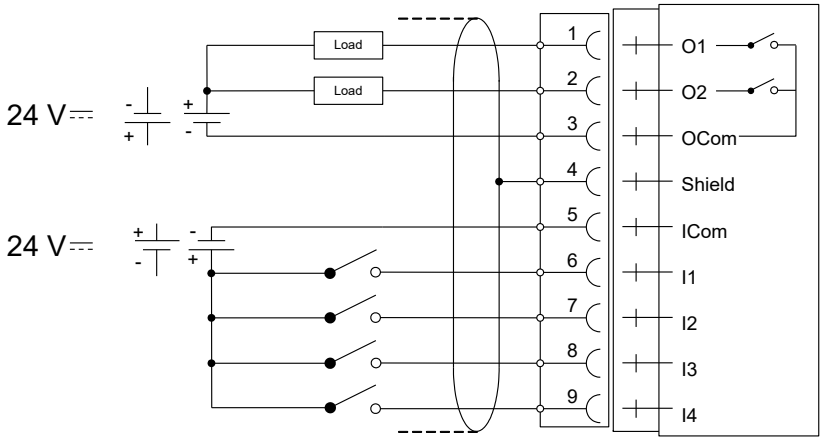
Shielded cable/cables must be used, with the shield connected to terminal 4. There are no limitations on the cable length as long as it is possible to ensure proper function.

Solid state relay outputs

Terminals 1 and 2 with terminal 3 (OCom) as a common connection.

Two digital (relay) outputs are provided with contact rating given in Technical data. External sourcing (24 V⎓) from the instrument power supply (max. 100 mA) or from a separate DC supply should be used. Note that either the positive or the negative pole of the voltage source (24 V⎓) can be connected to OCom (3).

Shielded cable/cables must be used, with the shield connected to terminal 4. There are no limitations on the cable length as long as it is possible to ensure proper function.



AOUT1 and AOUT4

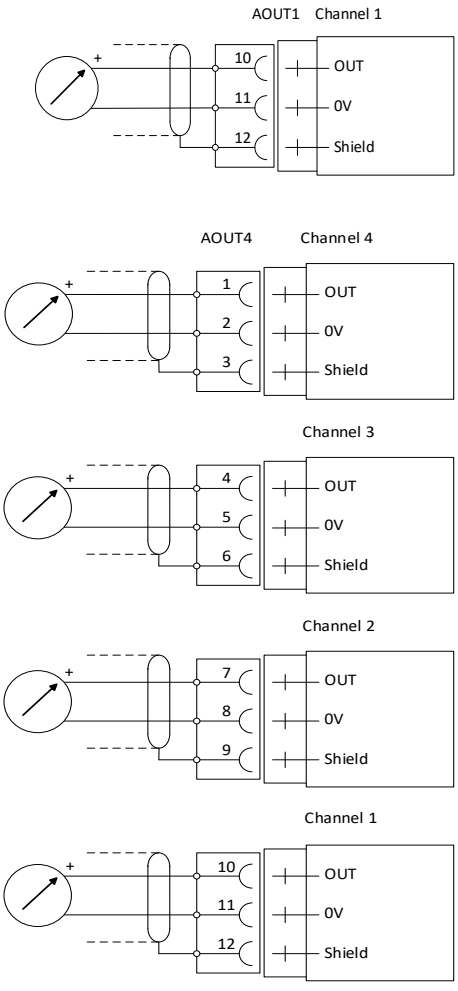
The voltage levels on connectors of I/O modules shall not exceed voltage levels of 30 Vrms, 42.4 Vpeak or 60 Vdc under normal conditions.
In wet locations these voltage levels shall not exceed 16 Vrms, 22.6 Vpeak or 35 Vdc.

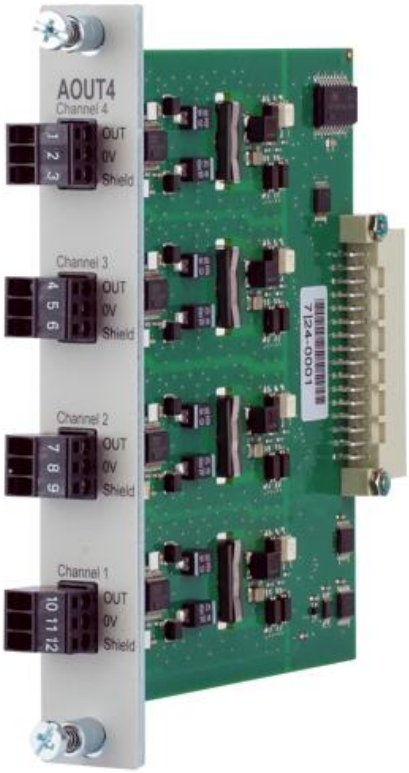
Analog outputs

The AOUT4 unit has four analog output channels, independently isolated by operational insulation.
The AOUT1 has one output channel, isolated by operational insulation.

The analog output signal will be connected to terminals
10, 11 (channel 1)
7, 8 (channel 2)
4, 5 (channel 3)
1, 2 (channel 4)

Shielded cable/cables must be used and the shield(s) must be connected to the shield terminal(s) 12, 9, 6 and 3.
The shields can be connected to the most convenient ground/earth point. There are no limitations on the cable length as long as it is possible to ensure proper function.



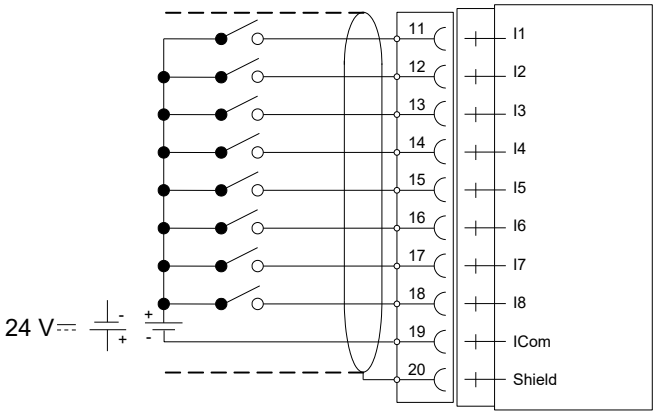


DIO8

The voltage levels on connectors of I/O modules shall not exceed voltage levels of 30 Vrms, 42.4 Vpeak or 60 Vdc under normal conditions. In wet locations these voltage levels shall not exceed 16 Vrms, 22.6 Vpeak or 35 Vdc.

Digital inputs

Terminals 11 – 18 and terminal 19 (ICom) as a common connection.
Eight digital inputs are provided, with functions that can be set in the G6 set-up.
External sourcing (24 V⎓) from the instrument power supply (max. 100 mA) or from a separate DC supply must be used.
Note that either the positive or the negative pole of the voltage source (24 V⎓) can be connected to ICom (19).
Shielded cable/cables must be used, with the shield connected to terminal 20. There are no limitations on the cable length as long as it is possible to ensure proper function.

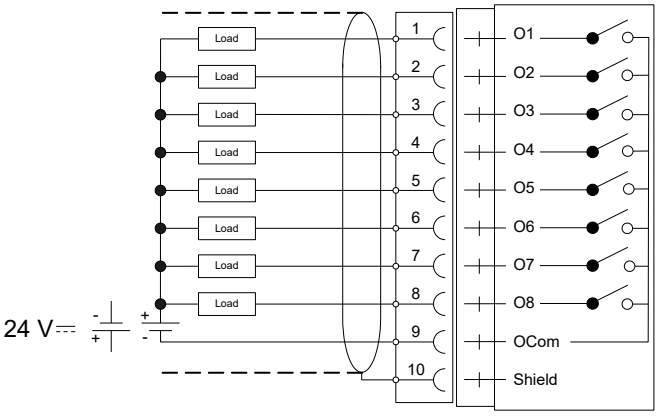


Solid state relay outputs

Terminals 1 - 8 with terminal 9 (OCom) as a common connection.

Eight digital (relay) outputs are provided with contact rating given in Technical data. External sourcing (24 V⎓) from the instrument power supply (max. 100 mA) or from a separate DC supply must be used. Note that either the positive or the negative pole of the voltage source (24 V⎓) can be connected to OCom (9).

Shielded cable/cables must be used, with the shield connected to terminal 10. There are no limitations on the cable length as long as it is possible to ensure proper function.



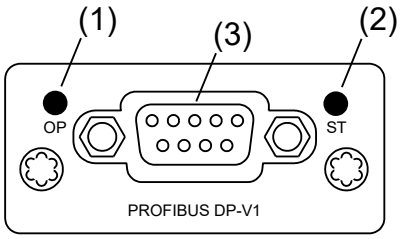
PROFIBUS-DP Fieldbus Adaptor

PROFIBUS module front view

(1) Operation mode LED

(2) Status LED

(3) PROFIBUS connector



Operation mode LED

State	Indication
Off	Not online / No power
Green	On-line, data exchange
Flashing Green	On-line, clear
Flashing Red (1 flash)	Parameterization error
Flashing Red (2 flashes)	PROFIBUS configuration error

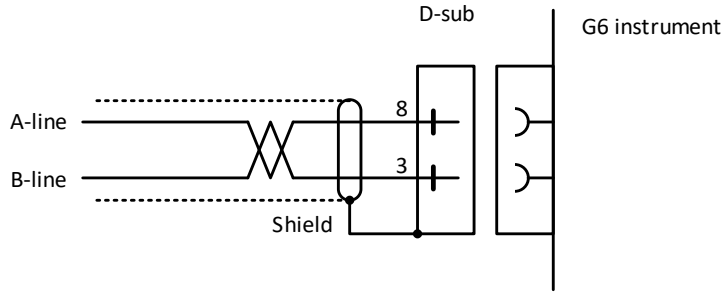
Status LED

State	Indication
Off	No power or not initialised
Green	Initialised
Flashing Green	Initialised, diagnostic event(s) present
Red	Exception error

PROFIBUS connector (DB9F)

Pin	Signal	Description
1	-	-
2	-	-
3	B line	Positive RxD/TxD, RS485 level
4	RTS	Request to send
5	GND Bus	Ground (isolated)
6	+ 5V Bus Output	+5V termination power (isolated)
7	-	-
8	A line	Negative RxD/TxD, RS485 level
9	-	-
Housing	Cable shield	Internally connected to the Anybus protective earth via cable shield filters according to the PROFIBUS standard.

For connection of the adaptor to the PROFIBUS master, use a PROFIBUS standard cable and connector according to the diagram below.



For reliable fieldbus function, line termination must be arranged in both ends of the transmission line. For a G6 instrument, at the end of the cable, a connector with line termination should be used. For all other G6 Instruments connection without line termination should be used.

For configuration of the adaptor, a GSD file is available and should be installed in the master.

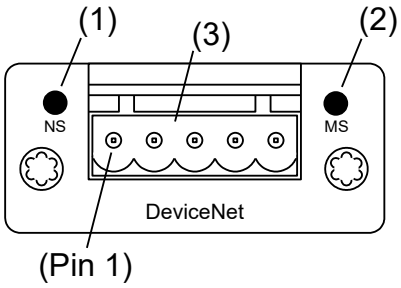
DeviceNet Fieldbus Adaptor

DeviceNet module front view

(1) Network Status LED

(2) Module Status LED

(3) DeviceNet connector



Network Status LED

State	Indication
Off	Not online / No power
Green	On-line, one or more connections are established
Flashing Green (1 Hz)	On-line, no connections established
Red	Critical link failure
Flashing Red (1 Hz)	One or more connections time out
Alternating Red/Green	Self test

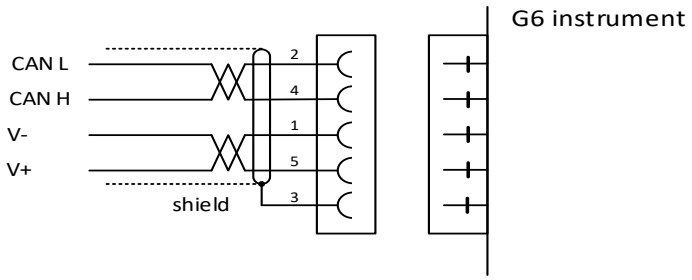
Module Status LED

State	Indication
Off	No power
Green	Operating in normal condition
Flashing Green (1 Hz)	Missing or incomplete configuration
Red	Unrecoverable fault(s)
Flashing Red (1 Hz)	Recoverable fault(s)
Alternating Red/Green	Self test

DeviceNet connector

Pin	Signal	Description
1	V-	Negative bus supply voltage
2	CAN L	CAN low bus line
3	Shield	Cable shield
4	CAN H	CAN high bus line
5	V+	Positive bus supply voltage

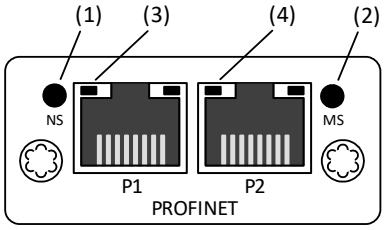
For connection of the adaptor to the DeviceNet master, use a standard cable for DeviceNet, or similar shielded cable with twisted pairs and a connector according to the diagram below. Make sure that the cable shield connected to pin 3 of the DeviceNet connector is as short as possible and in no way longer than 25 mm.



For reliable fieldbus function, line termination must be arranged in both ends of the transmission line. For a G6 instrument placed at the end of the line, terminate line by placing a 121-Ohm resistor between CAN L (pin 2) and CAN H (pin 4).

For configuration of the adaptor an EDS file is supplied with the instrument that should be installed in the master. Note that the EDS file is a generic type supplied by the module manufacturer. The file doesn’t contain any reference to the G6 Instrument or to BLH Nobel.

PROFINET Fieldbus Adaptor



PROFINET module front view

(1) Network Status LED

(2) Module Status LED

(3) Link/Activity Port 1

(4) Link/Activity Port 2

Network Status LED

LED State	Description	Comments
Off	Offline	No power or No connection with IO Controller
Green	Online (RUN)	-Connection with IO Controller established -IO Controller in RUN state
Green, 1 flash	Online (STOP)	-Connection with IO Controller established -IO Controller in STOP state or IO data bad -IRT synchronization not finished
Green, blinking	Blink	Used by engineering tools to identify the node on the network
Red	Fatal event	Major internal error (this indication is combined with a red module status LED)
Red, 1 flash	Station Name error	Station Name not set
Red, 2 flashes	IP address error	IP address not set
Red, 3 flashes	Configuration error	Expected Identification differs from Real Identification

Module Status LED

LED State	Description	Comments
Off	Not Initialized	No power OR Module in SETUP or NW_INIT state.
Green	Normal Operation	Module has shifted from the NW_INIT state.
Green, 1 flash	Diagnostic Event(s)	Diagnostic event(s) present
Red	Exception error	Device in state EXCEPTION.
	Fatal event	Major internal error (this indication is combined with a red network status LED)
Alternating Red/Greed	Firmware update	Do NOT power off the module. Turning the module off during this phase could cause permanent damage.

Link/Activity LED

LED State	Description	Comments
Off	No Link	No link, no communication present
Green	Link	Ethernet link established, no communication present
Green, flickering	Activity	Ethernet link established, communication present

A standard Ethernet cable of at least category 5 meeting PROFINET specification (acc. to IEEE 802.3 Ethernet) shall be used.

For configuration of the adaptor a GSD file is available and should be installed in the master.

3. Instrument Functionality

General

This chapter describes the functionality of the different parts of the force instrument.

Function Block

All measuring functions in the instrument are based on configurable function blocks.

A Function Block is used to calculate the force or web tension of one to four inputs and the sums and differences if more than one input is used. With a four channel Function Block there are intermediate sum of force/web tension values calculated (A + B and C + D).

The Function Block type is selected with parameter ‘Func.BlockX Type’ (Hardware Configuration menu) and the value of the parameter can be set to ‘Not In Use’, ‘1 Channel’, ‘2 Channel’ or ‘4 Channel’. The type is selected individually for each used Function Block.

A measuring channel, i.e. a connection on a WFIN / WFIN2 or HSWF2 module, should be assigned to each Function Block input. The inputs of a Function Block are named Input A to input D. Note that each measuring channel can only be assigned to one Function Block input. Inputs cannot be shared between Function Blocks. The maximum number of measuring channels in an instrument is 6.

A Function Block input can also be set to ‘Not In Use’ which means that the actual input value used is always 0. This can be useful when using three transducers in a 4 channel Function Block or for testing purposes.

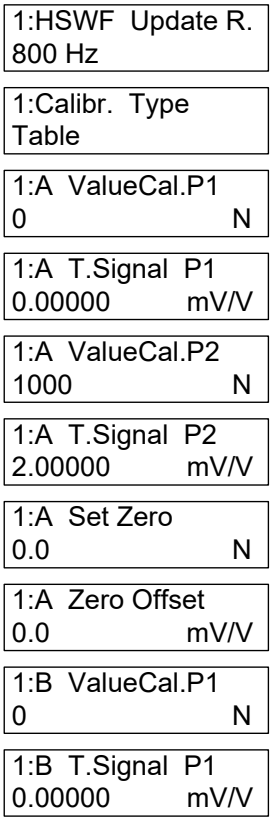
In the menu Param. Set-up – Calibration – Function Block 1 (- 8) are parameters for configuration and calibration located. Only used Function Blocks are displayed in the menu.

The calibration parameters shown in the figure is for Function Block 1.

There are sets of calibration parameters for each force input. Parameters named ‘1:A …..’ belongs to input A, parameters named ‘1:B …..’ belongs to input B and so on.

Calibration must be done for separately for each input.

All other parameters (‘1: …..’) are common for the whole Function Block.



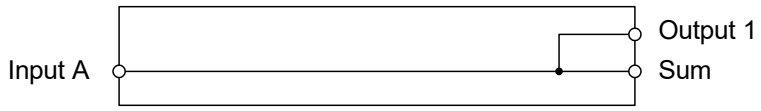
In the instrument and throughout this manual are outputs from Function Blocks used for Display, Analog Outputs, Levels, Communication, etc. These Output Signals are explained in the tables below. The actual value for each “Output” is depending on the Function Block type. E.g. if the sum of inputs C and D, on a 4 channel Function Block, should be monitored on an analog output, Output 2 should be chosen as the source for the analog

output. Also the input forces are available for monitoring etc, see ‘Common values’ later in this chapter.

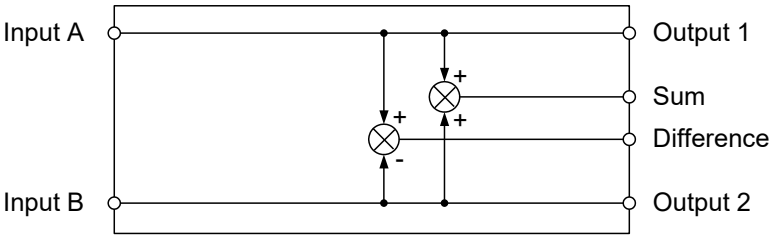
Force Mode

The following table and figures explains the function and the values from a Function Block in force mode (set-up parameter ‘X:Web T. Mode’ = Off).
A ‘(F)’ in the table below indicates a force value.

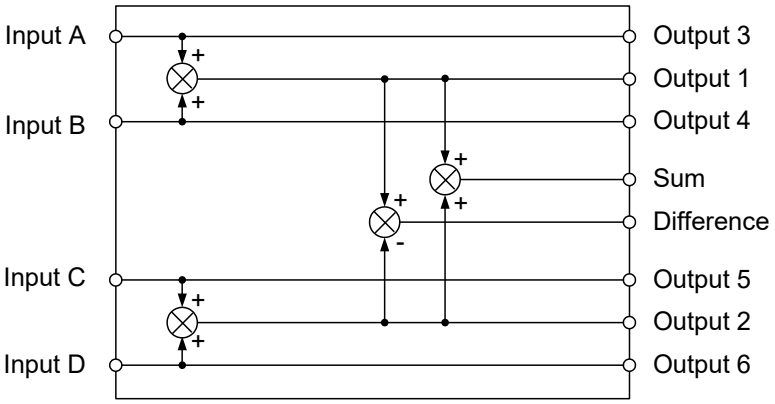
Value	1 Channel Func. Block	2 Channel Func. Block	4 Channel Func. Block
Sum	Input A (F)	Input A+B (F)	Input A+B+C+D (F)
Difference	-	Input A-B (F)	Input (A+B) – (C+D) (F)
Output 1	Input A (F)	Input A (F)	Input A+B (F)
Output 2	-	Input B (F)	Input C+D (F)
Output 3	-	-	Input A (F)
Output 4	-	-	Input B (F)
Output 5	-	-	Input C (F)
Output 6	-	-	Input D (F)



One Channel Function block, Force mode



Two Channel Function block, Force mode



Four Channel Function block, Force mode

Web Tension Mode

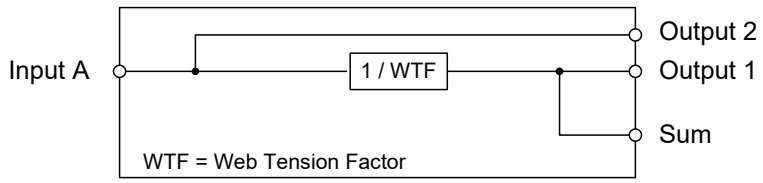
A Function Block can be configured for web tension measuring by setting set-up parameter ‘X:Web T. Mode’ to On. In this case some of the force values will be recalculated to a web tension value using the ‘X:Web T. Factor’ as shown below.

Web Tension Value = Force Value / Web Tension Factor

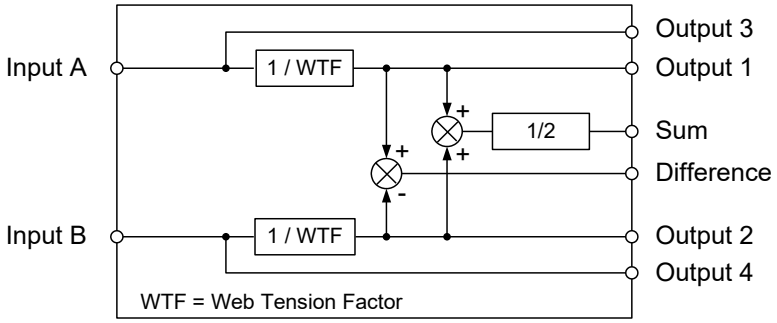
If the Force Values are correctly calibrated in the desired measuring direction then the ‘Web T. Factor’ shall be set to the length of the roller (machine width) to get correct Web Tension values, e.g. N/m. In other cases the ‘Web T. Factor’ must be calculated based on calibration direction, web tension measuring direction, roller length, etc.

The following table and figures explains the function and the values from a Function Block in web tension mode.
A ‘(F)’ in the table below indicates a force value and a ‘(WT)’ a web tension value.

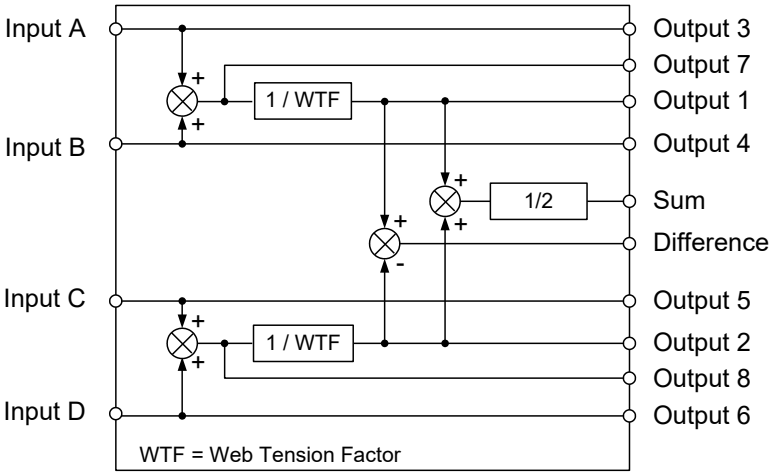
Value	**1 Channel Func. Block**	**2 Channel Func. Block**	**4 Channel Func. Block**
Sum	Input A (WT)	Input (A+B) / 2 (WT)	Input (A+B+C+D) / 2 (WT)
Difference	-	Input A-B (WT)	Input (A+B) – (C+D) (WT)
Output 1	Input A (WT)	Input A (WT)	Input A+B (WT)
Output 2	Input A (F)	Input B (WT)	Input C+D (WT)
Output 3	-	Input A (F)	Input A (F)
Output 4	-	Input B (F)	Input B (F)
Output 5	-	-	Input C (F)
Output 6	-	-	Input D (F)
Output 7	-	-	Input A+B (F)
Output 8	-	-	Input C+D (F)



One Channel Function block, Web Tension mode



Two Channel Function block, Web Tension mode



Four Channel Function block, Web Tension mode

Common values

The following table explains the available input values to a Function Block. These values are the same for a Function Block both in force mode and tension mode.

Value	1 Channel Func. Block	2 Channel Func. Block	4 Channel Func. Block
Input A Force	Inp. A Force	Inp. A Force	Inp. A Force
Input B Force	-	Inp. B Force	Inp. B Force
Input C Force	-	-	Inp. C Force
Input D Force	-	-	Inp. D Force
Input A Signal (mV/V)	Inp. A Signal	Inp. A Signal	Inp. A Signal
Input B Signal (mV/V)	-	Inp. B Signal	Inp. B Signal
Input C Signal (mV/V)	-	-	Inp. C Signal
Input D Signal (mV/V)	-	-	Inp. D Signal

4. Set-up

General

All operating functions in the G6 Instrument are controlled by parameters. The parameter values are permanently stored in the instrument and will not be lost when the unit is switched off. At delivery the parameters are factory-set to default values, giving the instrument an initial standard function.

The actual setting of the parameter values can be read and edited during normal measuring operation in sub menu ‘Parameter Set-up’.

Editing of parameter values can be performed using the alphanumeric display and keys on the front panel of the VIEWPAN module. After editing hardware parameters, the instrument will be restarted.

In the instrument there are two levels of security locks provided to protect from unauthorized access to instrument functions and editing of parameters and values. The locks are opened by four-digit codes.

> ***WARNING***
> *Changes done during editing of set-up parameters will affect the behavior of the instrument immediately. The user must take all necessary precautions to prevent any undesired effects in the process monitored or controlled by the G6 instrument or a connected control system.*
> *It is strongly recommended to activate the set-up lock in the instrument to prevent any unauthorized changes of set-up parameters.*

It’s a good practice to make a backup of the set-up after changes have been done. See chapter ‘Maintenance’ for more information on backup and restore.

The ‘Parameter Set-up’ menu contain the following sub menus:

General: This parameter group controls the general functionality of the instrument. Such as display language, display contrast, security, key functions and so on.

Hardware Configuration: Parameters used for configuring the instrument hardware. Here parameters that are used for basic configuration, of the Function blocks, found. Note that when the instrument is starting up it will check that the installed hardware is compatible with the settings. If not, an alarm will be issued.

Calibration: Parameters that affect the behaviour of the eight possible Function Blocks in the instrument. There are parameters for calibration type, calibration values, filter settings etc. All Function Blocks are individually settable.

Communication: Sub menus are Serial Com, Ethernet and Fieldbus.
Serial Com sub menu content is parameters used to set-up RS485 serial port on the CPU module. Parameters are among others: com. port mode, baud rate and data format. Ethernet sub menu content is parameters for Modbus TCP configuration. Fieldbus sub menu content is configuration parameters related to fieldbus communication such as address, baud rate and transmitted data setup.

Level Supervision: The instrument has 32 level supervisors that are configured from this sub menu. Settings for each level are which Function Block that the individual level is to monitor and which signal that shall be monitored from the selected Function Block. Signals that can be monitored are Sum value, Difference value, Output 1 and so on. The output function e.g. if the output shall be active above or below the set level is configured here. There are parameters for hysteresis setting and level switching delays.

Inputs: The use of the instruments digital inputs is set in this menu. Note that the inputs are numbered 11 to 38. Inputs 11 to 18 corresponds to inputs on slot 1 I/O module, 21 to 28 correspond to inputs on slot 2 I/O and so on. The actual number of inputs depends on what type of I/O-module that is installed in the respective slots. A DIO8 module has 8 inputs a WFIN2 module has 4 inputs while an AOUT1 or AOUT4 has no inputs. Inputs can be used for zeroing of Function Blocks.

Outputs: The outputs menu contains the settings controlling the function of each output. Numbering is 11 to 38 for the I/O module outputs. See section ‘Inputs’ above on how individual output numbers correspond to each I/O slot. Each output can be assigned an output function: Level output status or ‘In Process’ status.

Analog Outputs: This menu controls the behaviour of an AOUT4 or an AOUT1 Analog output module. The output signal source (Function Block No and signal type) can be selected. Also output type and range high/low is settable.

Program Options: This menu contains the options that can be used. Program options are enabled using a purchased option code. Contact your supplier for more information.

Operator interface

The DIN-rail type of instrument uses the service panel (VIEWPAN) located in the I/O slot system of the instrument as operator interface. It also includes a 24 VDC power supply that supports the complete instrument with power. The VIEWPAN module occupies slots 4 to 6.

It is also possible to connect a standard USB keyboard for PC to the USB connector at the CPU module. The keyboard will work in parallel with the keys on VIEWPAN and will make it easier to handle the configuration of the instrument, as it can be used as an input for digits and characters.

The keyboard keys ' + ', ' - ', ' ↑ ' or 'Esc', and 'Enter' will correspond the VIEWPAN keys ' + ', ' - ', ' ↑ ' , and ' ↵ '.

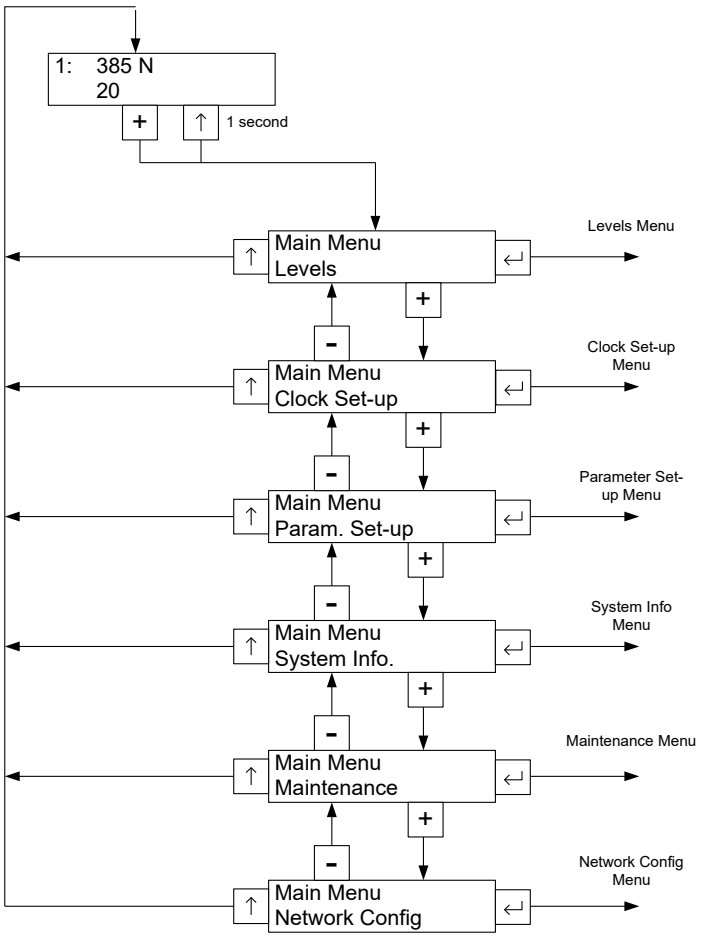
Function key 'F11' on the keyboard can be used to access the 'Main Menu'.

VIEWPAN module

From any of the operating display views, displaying the main menu is done by pressing '+' and '↑' keys simultaneously for 1 second.

The ViewPan '+' and '–' keys are used to scroll the available menu items and the '↵' key is used to enter the selected sub menu. Pressing the '↑' key when in the main menu will make the instrument display the operating menu.

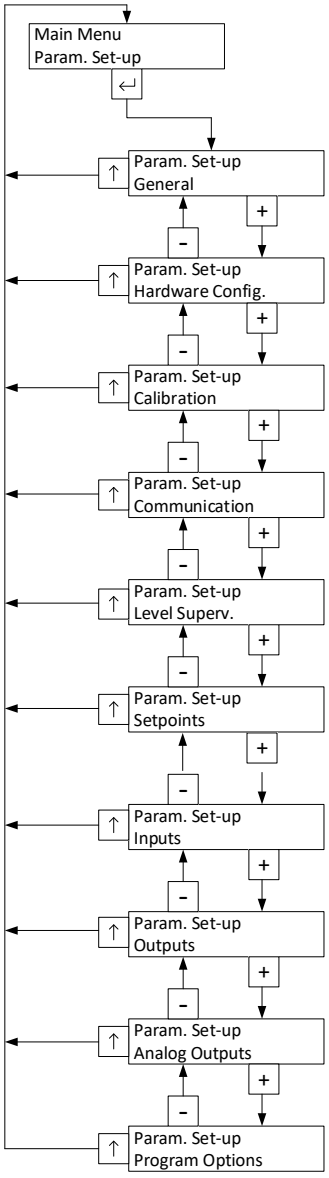
To move one step back in the menu structure press the '↑' key. The '↑' key is also used to cancel any parameter editing.



VIEWPAN main menu

Parameter Set-up menu

To enter a Parameter Set-up sub menu the desired one is selected by scrolling with '+' or '–' keys until it's shown. Then the sub menu is entered by pressing '↵'. Returning to 'Main Menu' from 'Parameter Set-up' menu is done by pressing the '↑' key.



Parameter set-up menu

Parameter editing procedure

This example shows the ‘General’ parameter menu but editing is done similar throughout the menu system.

The desired menu is selected by scrolling with ‘+’ or ‘–’ keys until it is shown. Then the sub menu is entered by pressing ‘↵’. Returning to previous menu from a sub menu is done by pressing the ‘↑’ key.

The desired parameter is selected by scrolling with ‘+’ or ‘–’ keys until it is shown. As the wanted set-up parameter is displayed, press ‘↵’ to start the editing procedure. This will place a flashing cursor to the left on the lower line, and a numerical parameter value will get leading zeros. The cursor indicates that editing can be performed and that the panel key functions are different.

<u>+ Key function:</u>

Increment the cursor digit, or go to next alternative in case of a choice parameter.

<u>– Key function:</u>

Decrement the cursor digit, or go to previous alternative in case of a choice parameter.

<u>↵ Key function (short press):</u>

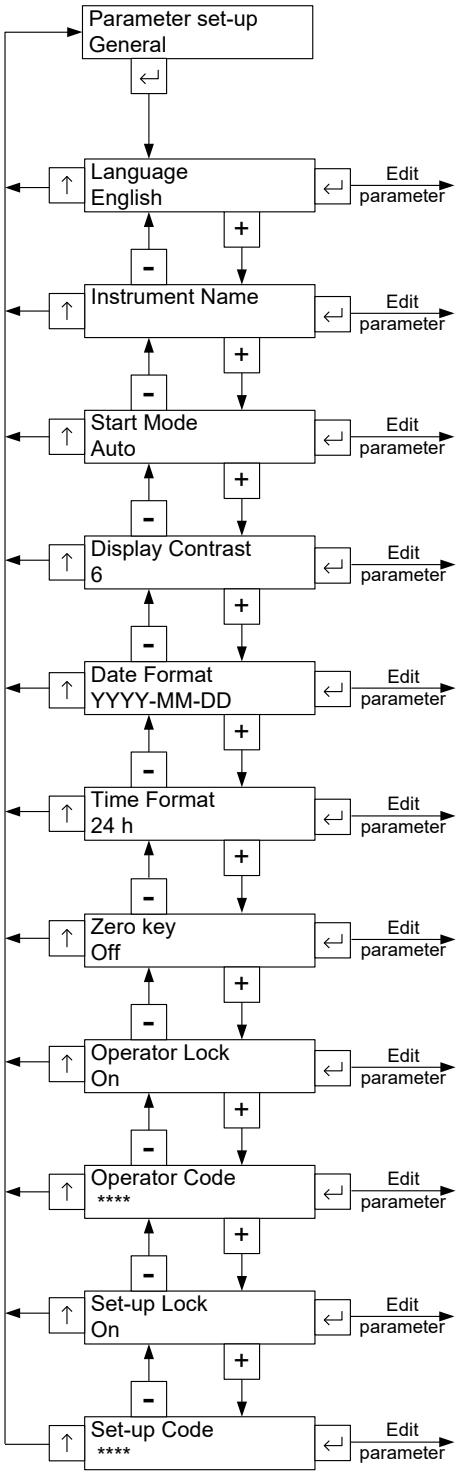
Accept the value of the cursor digit and go to next digit.

<u>↵ Key function (1 sec press):</u>

Accept the actual parameter value and finish editing. If a value outside the range for a numeric parameter is entered, an error message is displayed. Then press any key to remove the message and make continued editing possible.

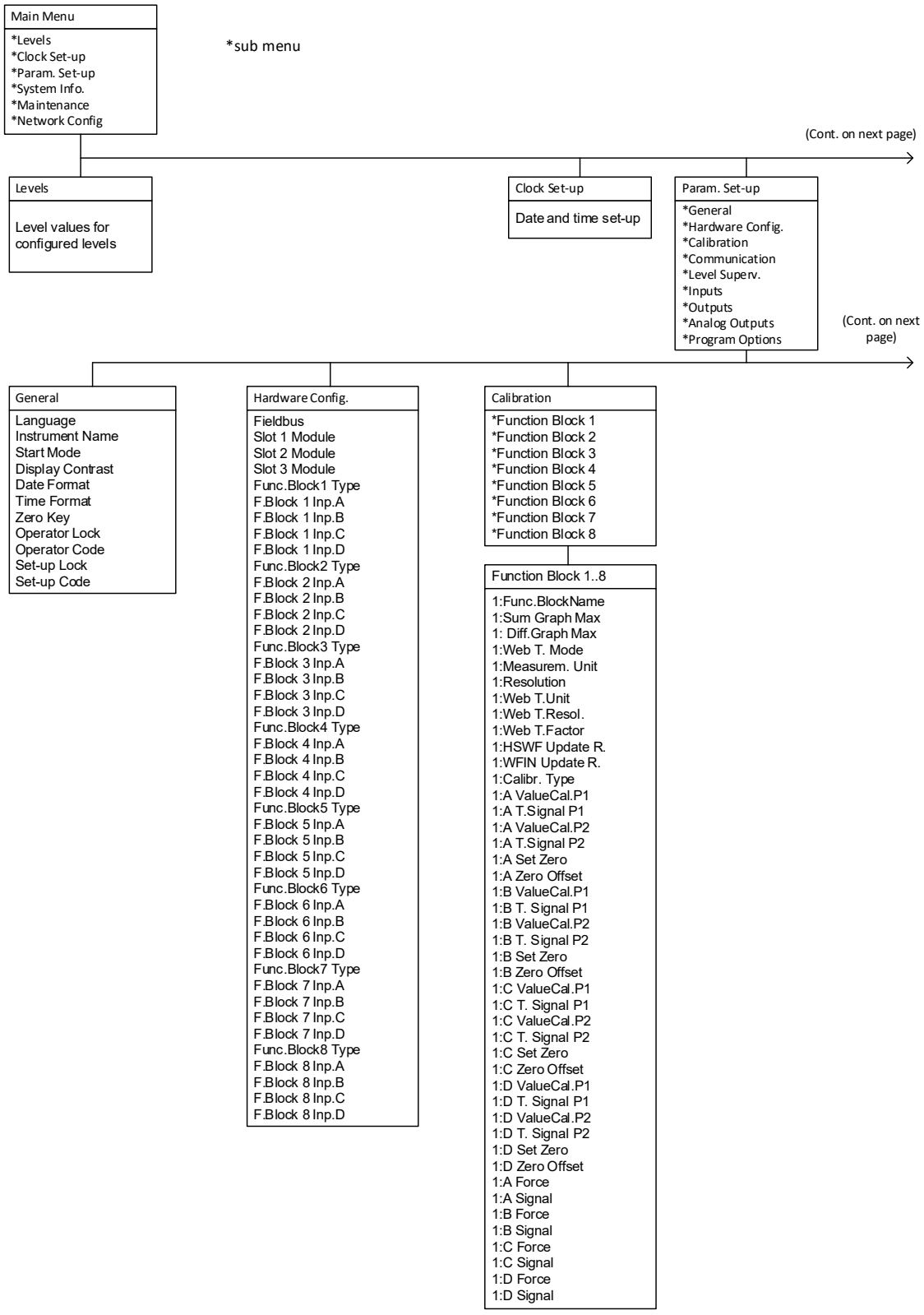
<u>↑ Key function:</u>

Cancel the edited value, and interrupt the editing.

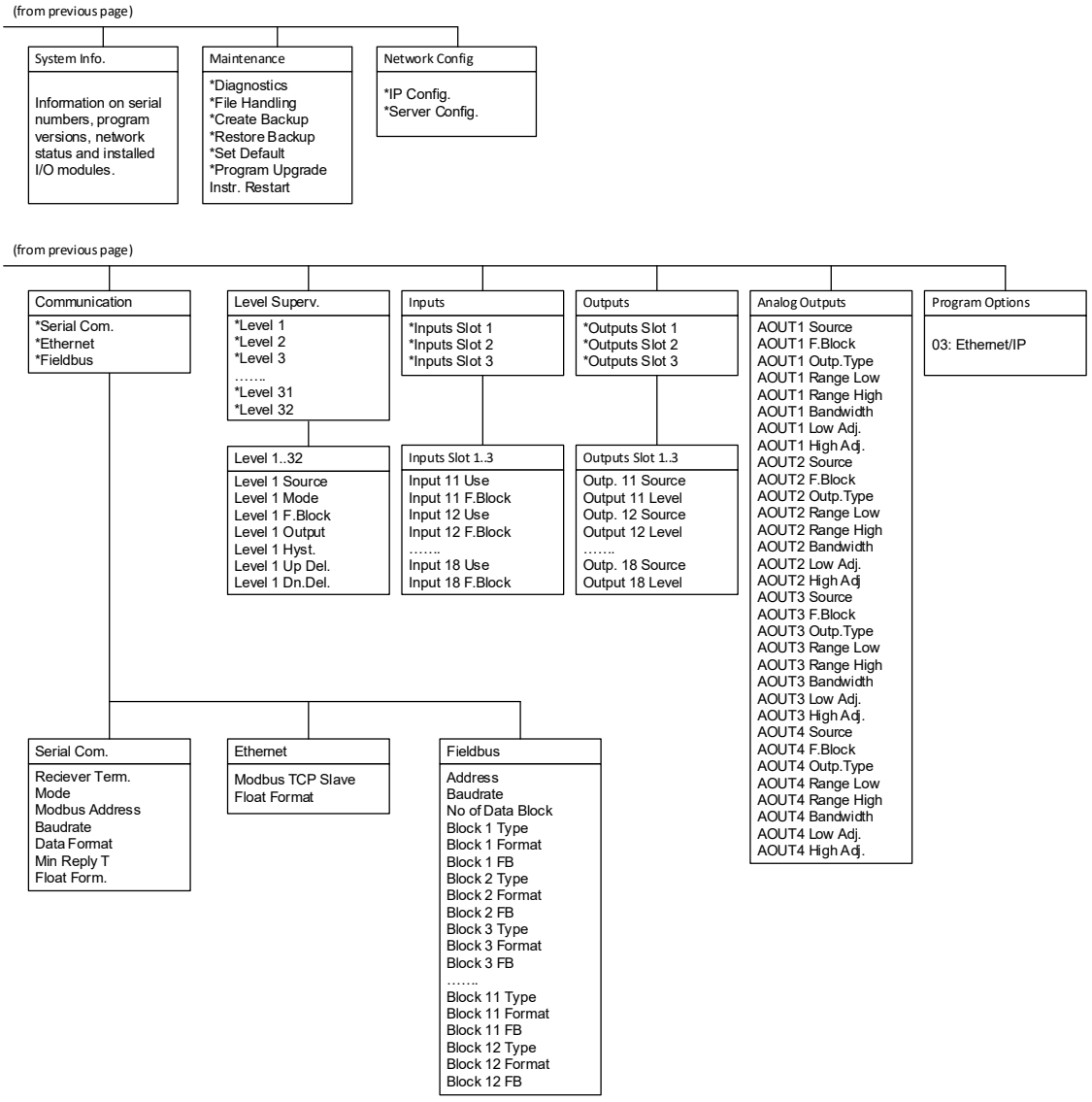


’General’ parameters menu

Menu structure



Menu structure (continued)



(continued) Menu structure

Parameters

On the following pages a survey of all parameters is presented. The parameters are divided in groups following the menu they belong to. For choice parameters the available choices are given. For numerical parameters, a value range is given.

At the end of the table, the default value is given in < >.

To the right there is a short parameter explanation and, *in italic,* the results for the different alternatives.

Range/Alternatives <default value>	Explanation and result of alternatives

Menu 'General'

Language

English Svenska <English>	Defines the language to be used in menus and messages.

Instrument Name

<>	A 16-character string, shown in Remote Access.

Start Mode

Command Auto <Auto>	Defines the start mode after power-on or reset. ***Command:*** *A 'start operation' command from control computer or panel key is required for start up.* ***Auto:*** *Automatic start up.*

Display Contrast

0 1 2 3 4 5 6 7 <3>	Defines the text contrast for the alphanumerical display. ***Low values*** *giving lower contrast.* ***High values*** *giving sharper characters but reduced readability at slanted display.*

Date Format

YYYY-MM-DD YYYY-DD-MM DD-MM-YYYY MM/DD/YYYY <YYYY-MM-DD>	Defines the date format. ***YYYY:*** = *year.* ***MM:*** = *month.* ***DD:*** = *day.*

Range/Alternatives <default value>	Explanation and result of alternatives
Time Format	
12 h 24 h <24h>	Defines the time format. ***12 h:*** *12 hour time format.* ***24 h:*** *24 hour time format.*
Zero Key	
Off On <Off>	Disables/enables the Zero function from the front panel. ***Off:*** *The Zero function is disabled.* ***On:*** *The Zero function is enabled.*
Operator Lock	
Off On <Off>	***Off:*** *Operator lock is not activated.* ***On:*** *Operator lock is activated, preventing unauthorized access to the instrument.* See chapter ‘Operation – Security locks’
Operator Code	
Range: 1 - 9999 <1937>	Defines the valid code for Operator lock. If ‘Set-up lock’ (see below) is ‘On’ this code will not give access to functions that requires the ‘Set-up Code’. Note: this parameter is only shown if ‘Operator Lock’ is set to ‘On’
Set-up Lock	
Off On <Off>	***Off:*** *Set-up lock is not activated.* ***On:*** *Set-up lock is activated, preventing unauthorized access to the instrument.* See chapter ‘Operation – Security locks’
Set-up Code	
Range: 1 - 9999 <1937>	Defines the valid code for Set-up lock. If ‘Operator lock’ (see above) is ‘On’ this code will still give access to all menus in the Main menu. Note: this parameter is only shown if ‘Set-up Lock‘ is set to ‘On’

Range/Alternatives <default value>	Explanation and result of alternatives

Menu ‘Hardware Config.’

Fieldbus

Not In Use Profibus DeviceNet PROFINET <Not In Use>	This parameter defines what type of fieldbus that will be used in the CPU. ***Not In Use:*** *The fieldbus is not used regardless of any installed module.* ***Profibus:*** *Profibus fieldbus module is used.* ***DeviceNet:*** *DeviceNet fieldbus module is used.* ***PROFINET:*** *PROFINET fieldbus module is used.*

Slot 1 Module

No module HSWF2 WFIN WFIN2 AOUT1 AOUT4 DIO8 <WFIN2>	This parameter defines what type of I/O-module is installed in slot 1. ***No module:*** *No module is used in this slot.* ***HSWF2:*** *A 2 channel high speed weight/force module.* ***WFIN:*** *A 1 channel, weight/force measuring module.* ***WFIN2:*** *A 2 channel, weight/force measuring module.* ***AOUT1:*** *A 1 channel analog output module.* ***AOUT4:*** *A 4 channel analog output module.* ***DIO8:*** *A 8/8 digital input/output module.*

Slot 2 Module

< No module >	This parameter defines what type of I/O- module is installed in slot 2. See ‘Slot 1 Module type’ for details on parameter values.

Slot 3 Module

< No module >	This parameter defines what type of I/O- module is installed in slot 3. See ‘Slot 1 Module type’ for details on parameter values.

Func.Block1 Type

Not In Use 1 Channel 2 Channel 4 Channel < 1 Channel >	This parameter defines if Function Block 1 is used and, if used, the no of inputs it should use. ***Not In Use:*** *The Function Block is not used.* ***1 Channel:*** *1 channel type.* ***2 Channel:*** *2 channel type.* ***4 Channel:*** *4 channel type.*

Range/Alternatives <default value>	Explanation and result of alternatives

F.Block 1 Inp.A

Not In Use
Slot 1, Ch 1
Slot 1, Ch 2
Slot 2, Ch 1
Slot 2, Ch 2
Slot 3, Ch 1
Slot 3, Ch 2
(Slot 4, Ch 1)
(Slot 4, Ch 2)
(Slot 5, Ch 1)
(Slot 5, Ch 2)
(Slot 6, Ch 1)
(Slot 6, Ch 2)
< Slot 1, Ch 1 >

This parameter defines which measuring channel (slot and channel) that should be use as input A to Function Block 1.

Not In Use: *The input is not used*
Slot 1, Ch 1: *Use measuring channel 1 of slot 1*
Slot 1, Ch 2: *Use measuring channel 2 of slot 1*
Slot 2, Ch 1: *Use measuring channel 1 of slot 2*
Slot 2, Ch 2: *Use measuring channel 2 of slot 2*
Slot 3, Ch 1: *Use measuring channel 1 of slot 3*
Slot 3, Ch 2: *Use measuring channel 2 of slot 3*

Note: selection of 'Slot 4, Ch 1' to 'Slot 6, Ch 2' not allowed in the RM type of instrument.

Note: this parameter is not shown if 'Func. Block 1 Type' is 'Not In Use'.

F.Block 1 Inp.B

Not In Use
Slot 1, Ch 1
Slot 1, Ch 2
Slot 2, Ch 1
Slot 2, Ch 2
Slot 3, Ch 1
Slot 3, Ch 2
(Slot 4, Ch 1)
(Slot 4, Ch 2)
(Slot 5, Ch 1)
(Slot 5, Ch 2)
(Slot 6, Ch 1)
(Slot 6, Ch 2)
< Not In Use >

This parameter defines which measuring channel (slot and channel) that should be use as input B to Function Block 1.

See 'F.Block 1 Inp.A' for a description of parameter values.

Note: this parameter is only shown if 'Func. Block 1 Type' is '2 Channel' or '4 Channel'.

F.Block 1 Inp.C

< Not In Use >

This parameter defines which measuring channel (slot and channel) that should be use as input C to Function Block 1.

See 'F.Block 1 Inp.A' for a description of parameter values.

Note: this parameter is only shown if 'Func. Block 1 Type' is '4 Channel'.

F.Block 1 Inp.D

< Not In Use >

This parameter defines which measuring channel (slot and channel) that should be use as input D to Function Block 1.

See 'F.Block 1 Inp.A' for a description of parameter values.

Note: this parameter is only shown if 'Func. Block 1 Type' is '4 Channel'.

Range/Alternatives <default value>	Explanation and result of alternatives
Func.Block 2 Type	
Not In Use 1 Channel 2 Channel 4 Channel < 1 Channel >	This parameter defines if Function Block 2 is used and, if used, the no of inputs it should use. ***Not In Use:*** *The Function Block is not used.* ***1 Channel:*** *1 channel type.* ***2 Channel:*** *2 channel type.* ***4 Channel:*** *4 channel type.*
F.Block 2 Inp.A	
< Slot 1, Ch 2 >	This parameter defines which measuring channel (slot and channel) that should be used as input A to Function Block 2. See 'F.Block 1 Inp.A' for a description of parameter values. Note: this parameter is not shown if 'Func. Block 2 Type' is 'Not In Use'.
F.Block 2 Inp.B	
< Not In Use >	This parameter defines which measuring channel (slot and channel) that should be used as input B to Function Block 2. See 'F.Block 1 Inp.A' for a description of parameter values. Note: this parameter is only shown if 'Func. Block 2 Type' is '2 Channel' or '4 Channel'.
F.Block 2 Inp.C	
< Not In Use >	This parameter defines which measuring channel (slot and channel) that should be used as input C to Function Block 2. See 'F.Block 1 Inp.A' for a description of parameter values. Note: this parameter is only shown if 'Func. Block 2 Type' is '4 Channel'.
F.Block 2 Inp.D	
< Not In Use >	This parameter defines which measuring channel (slot and channel) that should be used as input D to Function Block 2. See 'F.Block 1 Inp.A' for a description of parameter values. Note: this parameter is only shown if 'Func. Block 2 Type' is '4 Channel'.

Range/Alternatives <default value>	Explanation and result of alternatives

Func.Block3 Type

Not In Use 1 Channel 2 Channel 4 Channel < Not In Use >	This parameter defines if Function Block 3 is used and, if used, the no of inputs it should use. ***Not In Use:*** *The Function Block is not used.* ***1 Channel:*** *1 channel type.* ***2 Channel:*** *2 channel type.* ***4 Channel:*** *4 channel type.*

F.Block 3 Inp.A

< Not In Use >	This parameter defines which measuring channel (slot and channel) that should be used as input A to Function Block 3. See 'F.Block 1 Inp.A' for a description of parameter values. Note: this parameter is not shown if 'Func. Block 3 Type' is 'Not In Use'.

F.Block 3 Inp.B

< Not In Use >	This parameter defines which measuring channel (slot and channel) that should be used as input B to Function Block 3. See 'F.Block 1 Inp.A' for a description of parameter values. Note: this parameter is only shown if 'Func. Block 3 Type' is '2 Channel' or '4 Channel'.

F.Block 3 Inp.C

< Not In Use >	This parameter defines which measuring channel (slot and channel) that should be used as input C to Function Block 3. See 'F.Block 1 Inp.A' for a description of parameter values. Note: this parameter is only shown if 'Func. Block 3 Type' is '4 Channel'.

F.Block 3 Inp.D

< Not In Use >	This parameter defines which measuring channel (slot and channel) that should be used as input D to Function Block 3. See 'F.Block 1 Inp.A' for a description of parameter values. Note: this parameter is only shown if 'Func. Block 3 Type' is '4 Channel'.

For an explanation of parameters for Function Blocks 4 to 8 see:

'Func.Block3 Type'
'F.Block 3 Inp.A'
'F.Block 3 Inp.B'
'F.Block 3 Inp.C'
'F.Block 3 Inp.D'

Note that the parameters for a Function Block are shown or not shown depending on the setting of parameter 'Func. Block X Type', for that specific Function Block.

Range/Alternatives <default value>	Explanation and result of alternatives

Menus ‘Function Block 1’ – ‘Function Block 8’

The Calibration menu contains up to 6 sub menus, one for each used Function Block. The parameters are the same for all 6 menus. Here only Function Block 1 parameters are shown. Note that the Function Block number is shown as a prefix to the parameter name, here ‘1:’ Also note that the menu is only shown if the parameter ‘Func. Block X Type’, for the actual Function Block, is not set to ‘Not In Use’.

1:Func.BlockName

<>	A 16-character string shown when using Remote Access.

1:Sum Graph Max

Range: 0.001 to 999999 Unit: Measurement or Web Tension unit <1000>	Sets the value that maximum indication on the sum graph corresponds to. The sum graph is displayed on the single Function Blocks operating display in Live View (remote access). Note: This parameter is only used for Live View (remote access).

1:Diff.Graph Max

Range: 0.001 to 999999 Unit: Measurement or Web Tension unit <100>	Sets the value that maximum indication on the difference graph corresponds to. The difference graph is displayed on the single Function Blocks operating display in Live View (remote access). Note: This parameter is only used for Live View (remote access). It is only shown if the parameter ‘Func. Block 1 Type’ is set to ‘2 Channel’ or ’4 Channel’

1:Web T. Mode

Off On <Off>	Selects Force or Web Tension mode for the Function Block. ***Off:*** *Force mode.* ***On:*** *Web Tension Mode.*

Range/Alternatives <default value>	Explanation and result of alternatives

1:Measurem. Unit

NONE N daN kN MN lbf kgf Nm N/m kN/m PLI g kg t lb oz psi kPa MPa bar l mm m inch feet st pcs % mV/V <N>	Defines the unit that should be used for measured force value(s) and for related set-up parameters.

Range/Alternatives <default value>	Explanation and result of alternatives
1:Resolution	
0.001 0.002 0.005 0.01 0.02 0.05 0.1 0.2 0.5 1 2 5 10 20 50 <1>	Defines the decimal point position and resolution format for the displayed force value. All set-up parameters using the measurement unit will be written with the decimal point position selected in this menu. If the last digits of the displayed value are not stable, a more coarse resolution can be selected to get a stable reading.
1:Web T.Unit	
NONE N/m kN/m PLI % <N/m>	Defines the unit that should be used for measured web tension value(s) and for related set-up parameters. Note: this parameter is only shown if ‘1:Web Tension Mode‘ is set to ‘On’
1:Web T. Resol.	
0.001 0.002 0.005 0.01 0.02 0.05 0.1 0.2 0.5 1 2 5 10 20 50 <1>	Defines the decimal point position and resolution format for the displayed web tension value. All set-up parameters using the web tension unit will be written with the decimal point position selected in this menu. If the last digits of the displayed value are not stable, a more coarse resolution can be selected to get a stable reading. Note: this parameter is only shown if ‘1:Web Tension Mode‘ is set to ‘On’
1:Web T.Factor	
Range: +/–999999 <1.00000>	This parameter defines the relations between a measured Force value and a Web Tension value. See chapter ‘Instrument Functionality – Function Block – Web Tension Mode’ Note: this parameter is only shown if ‘1:Web Tension Mode‘ is set to ‘On’

Range/Alternatives <default value>	Explanation and result of alternatives

1:HSWF Update R.

25 Hz 50 Hz 100 Hz 200 Hz 400 Hz 800 Hz	Defines the update rate for the measuring channel belonging to Function Block 1 if the force conversion module is of HSWF2 type. Note: this parameter is only shown if the force conversion module belonging to this Function Block 1 is of HSWF2 type.
800 Hz ++ <800 Hz>	The instrument must be restarted when update rate has been changed.

1:WFIN Update R.

9.3 Hz 19 Hz 37 Hz 75 Hz 150 Hz 300 Hz	Defines the update rate for the measuring channel belonging to Function Block 1 if the force conversion module is of WFIN or WFIN2 type. Note: this parameter is only shown if the force conversion module belonging to Function Block 1 is of WFIN or WFIN2 type.
300 Hz ++ <300 Hz>	The instrument must be restarted when update rate has been changed.

1:Calibr. Type

Known Force Table < Table >	Defines the type of calibration to be performed. A new calibration is initiated as a 'Calibration type' is selected and Enter key pressed. ***Known Force:*** *Known Force calibration is normally the most accurate calibration type. It is recommended to load with at least 2/3 of the used range.* ***Table:*** *Table calibration is used when calibrating with data from transducer calibration data sheet or when entering recorded values from a previous calibration into a replacement instrument.*

Range/Alternatives <default value>	Explanation and result of alternatives
1:A ValueCal.P1	
Range: +/–999999 Unit: Measurement Unit <0>	This parameter defines, for Input A, the load in the lowest calibration point, normally 0. The live force will be displayed when the enter button is pressed. Press the enter button a second time to edit the value. Note: This parameter is not shown if parameter 'F.Block 1 Inp.A' is set to 'Not In Use'.
1:A T.Signal P1	
Range: +/–9.99999 Unit: mV/V <0.00000>	This parameter defines the transducer signal, for Input A, in the lowest calibration point. Note: This parameter value is automatically acquired, and cannot be edited, if '1:Calibr. Type' is set to 'Known Force'. It is not shown if parameter 'F.Block 1 Inp.A' is set to 'Not In Use'.
1:A ValueCal.P2	
Range: +/–999999 Unit: Measurement Unit <1000>	This parameter defines, for Input A, the load in the second calibration point. The live force will be displayed when the enter button is pressed. Press the enter button a second time to edit the value. Note: This parameter is not shown if parameter 'F.Block 1 Inp.A' is set to 'Not In Use'.
1:A T.Signal P2	
Range: +/–9.99999 Unit: mV/V <2.00000>	This parameter defines the transducer signal, for Input A, in the second calibration point. Note: This parameter value is automatically acquired, and cannot be edited, if '1:Calibr. Type' is set to 'Known Force'. It is not shown if parameter 'F.Block 1 Inp.A' is set to 'Not In Use'.
1:A Set Zero	
Range +/-999999 Unit: Measurement Unit < 0 >	This parameter is used to zero input A for Function Block 1. Enter wanted value for the actual force on Input A, usually '0', i.e. unloaded transducer. The live force will be displayed when the enter button is pressed. Press the enter button a second time to edit the zeroing value. Note: This parameter is not shown if parameter 'F.Block 1 Inp.A' is set to 'Not In Use'.
1:A Zero Offset	
Range +/-999999 Unit: Measurement Unit < 0 >	This parameter shows the offset value acquired, for Input A, by zeroing with '1:A Set Zero'. If this parameter is edited, the zeroing of Input A will be influenced. Note: This parameter is not shown if parameter 'F.Block 1 Inp.A' is set to 'Not In Use'.

Range/Alternatives <default value>	Explanation and result of alternatives
1:B ValueCal.P1	
Range: +/–999999 Unit: Measurement Unit <0>	This parameter defines, for Input B, the load in the lowest calibration point, normally 0. The live force will be displayed when the enter button is pressed. Press the enter button a second time to edit the value. Note: This parameter is only shown if parameter 'Func. Block 1 Type' is set to '2 channel' or '4 Channel' and 'F.Block 1 Inp.B' is not set to 'Not In Use'.
1:B T.Signal P1	
Range: +/–9.99999 Unit: mV/V <0.00000>	This parameter defines the transducer signal, for Input B, in the lowest calibration point. Note: This parameter value is automatically acquired, and cannot be edited, if '1:Calibr. Type' is set to 'Known Force'. It is only shown if parameter 'Func. Block 1 Type' is set to '2 channel' or '4 Channel' and 'F.Block 1 Inp.B' is not set to 'Not In Use'.
1:B ValueCal.P2	
Range: +/–999999 Unit: Measurement Unit <1000>	This parameter defines, for Input B, the load in the second calibration point. The live force will be displayed when the enter button is pressed. Press the enter button a second time to edit the value. Note: This parameter is only shown if parameter 'Func. Block 1 Type' is set to '2 channel' or '4 Channel' and 'F.Block 1 Inp.B' is not set to 'Not In Use'.
1:B T.Signal P2	
Range: +/–9.99999 Unit: mV/V <2.00000>	This parameter defines the transducer signal, for Input B, in the second calibration point. Note: This parameter value is automatically acquired, and cannot be edited, if '1:Calibr. Type' is set to 'Known Force'. It is only shown if parameter 'Func. Block 1 Type' is set to '2 channel' or '4 Channel' and 'F.Block 1 Inp.B' is not set to 'Not In Use'.
1:B Set Zero	
Range +/-999999 Unit: Measurement Unit < 0 >	This parameter is used to zero input B for Function Block 1. Enter wanted value for the actual force on Input B, usually '0', i.e. unloaded transducer. The live force will be displayed when the enter button is pressed. Press the enter button a second time to edit the zeroing value. Note: This parameter is only shown if parameter 'Func. Block 1 Type' is set to '2 channel' or '4 Channel' and 'F.Block 1 Inp.B' is not set to 'Not In Use'.
1:B Zero Offset	
Range +/-999999 Unit: Measurement Unit < 0 >	This parameter shows the offset value acquired, for Input B, by zeroing with '1:B Set Zero'. If this parameter is edited, the zeroing of Input B will be influenced. Note: This parameter is only shown if parameter 'Func. Block 1 Type' is set to '2 channel' or '4 Channel' and 'F.Block 1 Inp.B' is not set to 'Not In Use'.

Range/Alternatives <default value>	Explanation and result of alternatives
1:C ValueCal.P1	
Range: +/–999999 Unit: Measurement Unit <0>	This parameter defines, for Input C, the load in the lowest calibration point, normally 0. The live force will be displayed when the enter button is pressed. Press the enter button a second time to edit the value. Note: This parameter is only shown if parameter 'Func. Block 1 Type' is set to '4 Channel' and 'F.Block 1 Inp.C' is not set to 'Not In Use'.
1:C T.Signal P1	
Range: +/–9.99999 Unit: mV/V <0.00000>	This parameter defines the transducer signal, for Input C, in the lowest calibration point. Note: This parameter value is automatically acquired, and cannot be edited, if '1:Calibr. Type' is set to 'Known Force'. It is only shown if parameter 'Func. Block 1 Type' is set to '4 Channel' and 'F.Block 1 Inp.C' is not set to 'Not In Use'.
1:C ValueCal.P2	
Range: +/–999999 Unit: Measurement Unit <1000>	This parameter defines, for Input C, the load in the second calibration point. The live force will be displayed when the enter button is pressed. Press the enter button a second time to edit the value. Note: This parameter is only shown if parameter 'Func. Block 1 Type' is set to '4 Channel' and 'F.Block 1 Inp.C' is not set to 'Not In Use'.
1:C T.Signal P2	
Range: +/–9.99999 Unit: mV/V <2.00000>	This parameter defines the transducer signal, for Input C, in the second calibration point. Note: This parameter value is automatically acquired, and cannot be edited, if '1:Calibr. Type' is set to 'Known Force'. It is only shown if parameter 'Func. Block 1 Type' is set to '4 Channel' and 'F.Block 1 Inp.C' is not set to 'Not In Use'.
1:C Set Zero	
Range +/-999999 Unit: Measurement Unit < 0 >	This parameter is used to zero input C for Function Block 1. Enter wanted value for the actual force on Input C, usually '0', i.e. unloaded transducer. The live force will be displayed when the enter button is pressed. Press the enter button a second time to edit the zeroing value. Note: This parameter is only shown if parameter 'Func. Block 1 Type' is set to '4 Channel' and 'F.Block 1 Inp.C' is not set to 'Not In Use'.
1:C Zero Offset	
Range +/-999999 Unit: Measurement Unit < 0 >	This parameter shows the offset value acquired, for Input C, by zeroing with '1:C Set Zero'. If this parameter is edited, the zeroing of Input C will be influenced. Note: This parameter is only shown if parameter 'Func. Block 1 Type' is set to '4 Channel' and 'F.Block 1 Inp.C' is not set to 'Not In Use'.

Range/Alternatives <default value>	Explanation and result of alternatives
1:D ValueCal.P1	
Range: +/–999999 Unit: Measurement Unit <0>	This parameter defines, for Input D, the load in the lowest calibration point, normally 0. The live force will be displayed when the enter button is pressed. Press the enter button a second time to edit the value. Note: This parameter is only shown if parameter 'Func. Block 1 Type' is set to '4 Channel' and 'F.Block 1 Inp.D' is not set to 'Not In Use'.
1:D T.Signal P1	
Range: +/–9.99999 Unit: mV/V <0.00000>	This parameter defines the transducer signal, for Input D, in the lowest calibration point. Note: This parameter value is automatically acquired, and cannot be edited, if '1:Calibr. Type' is set to 'Known Force'. It is only shown if parameter 'Func. Block 1 Type' is set to '4 Channel' and 'F.Block 1 Inp.D' is not set to 'Not In Use'.
1:D ValueCal.P2	
Range: +/–999999 Unit: Measurement Unit <1000>	This parameter defines, for Input D, the load in the second calibration point. The live force will be displayed when the enter button is pressed. Press the enter button a second time to edit the value. Note: This parameter is only shown if parameter 'Func. Block 1 Type' is set to '4 Channel' and 'F.Block 1 Inp.D' is not set to 'Not In Use'.
1:D T.Signal P2	
Range: +/–9.99999 Unit: mV/V <2.00000>	This parameter defines the transducer signal, for Input D, in the second calibration point. Note: This parameter value is automatically acquired, and cannot be edited, if '1:Calibr. Type' is set to 'Known Force'. It is only shown if parameter 'Func. Block 1 Type' is set to '4 Channel' and 'F.Block 1 Inp.D' is not set to 'Not In Use'.
1:D Set Zero	
Range +/-999999 Unit: Measurement Unit < 0 >	This parameter is used to zero input D for Function Block 1. Enter wanted value for the actual force on Input D, usually '0', i.e. unloaded transducer. The live force will be displayed when the enter button is pressed. Press the enter button a second time to edit the zeroing value. Note: This parameter is only shown if parameter 'Func. Block 1 Type' is set to '4 Channel' and 'F.Block 1 Inp.D' is not set to 'Not In Use'.
1:D Zero Offset	
Range +/-999999 Unit: Measurement Unit < 0 >	This parameter shows the offset value acquired, for Input D, by zeroing with '1:D Set Zero'. If this parameter is edited, the zeroing of Input D will be influenced. Note: This parameter is only shown if parameter 'Func. Block 1 Type' is set to '4 Channel' and 'F.Block 1 Inp.D' is not set to 'Not In Use'.

Range/Alternatives <default value>	Explanation and result of alternatives
1:A Force	This help display of live force value for Function Block 1, Input A, gives the possibility to check the force at any moment. This value is only shown if the input is used.
1:A Signal	This help display of live transducer signal for Function Block 1, Input A, gives the possibility to check the signal at any moment. This value is only shown if the input is used.
1:B Force	Live force value for Function Block 1, Input B. This value is only shown if the input is used.
1:B Signal	Live transducer signal for Function Block 1, Input B. This value is only shown if the input is used.
1:C Force	Live force value for Function Block 1, Input C. This value is only shown if the input is used.
1:C Signal	Live transducer signal for Function Block 1, Input C. This value is only shown if the input is used.
1:D Force	Live force value for Function Block 1, Input D. This value is only shown if the input is used.
1:D Signal	Live transducer signal for Function Block 1, Input D. This value is only shown if the input is used.

Range/Alternatives <default value>	Explanation and result of alternatives

Menu ‘Serial Com.’

Receiver Term.

Off
On
<Off>

***Off**: No termination on RS485 input (between pin 3 and 4)*
***On**: 120Ω termination on RS485 input (between pin 3 and 4)*

Mode

Not in use
Modbus Slave
<Not in use>

Defines use of serial port.
***Not in use:** The port is not used.*
***Modbus Slave:** The port is used for control unit communication.*

Modbus Address

Range: 1 to 247
<1>

Note: This parameter is only shown if ‘Modbus Slave’ is selected in ‘Mode’.

Baudrate

300
600
1200
2400
4800
9600
19200
38400
57600
115200
<9600>

Defines the baudrate for the serial communication.
The parameter must be set to the baudrate of the external equipment.

Note: This parameter is not shown if ‘Not in use’ is selected in ‘Mode’.

Data Format

7-none-2
7-even-1
7-even-2
7-odd-1
7-odd-2
8-none-1
8-none-2
8-even-1
8-odd-1
< 8-none-1 >

Defines the bit configuration for the serial communication.
The parameter must be set to the same configuration as for the external equipment.

Note: This parameter is not shown if ‘Not in use’ is selected in ‘Mode’.

Min Reply T

Range: 0 to 1000
Unit: ms
<0>

Adds a delay before the response to a command is sent. Used if the instrument sends its response to fast for the master.

Note: This parameter is not shown if ‘Not in use’ is selected in ‘Mode’.

Range/Alternatives <default value>	Explanation and result of alternatives

Float Form.

Modicon Float Float < Modicon Float >	Sets how the Modbus slave should handle floating point values. ***Modicon Float:*** *Modicon floating point format.* ***Float:*** *IEEE 32 bit floating point format* See chapter ‘Communication’ for details on floating point values. Note: This parameter is not shown if ‘Not in use’ is selected in ‘Mode’.

Range/Alternatives <default value>	Explanation and result of alternatives

Menu ‘Ethernet’

Modbus TCP Slave

On Off <On>	Enables/disables the Modbus TCP Slave. ***On:*** *Modbus TCP Slave enabled.* ***Off:*** *Modbus TCP Slave disabled.*

Float Format

Modicon Float Float < Modicon Float >	Sets how the Modbus TCP Slave should handle floating point values. ***Modicon Float:*** *Modicon floating point format.* ***Float:*** *IEEE 32 bit floating point format.* See chapter ‘Communication’ for details on floating point values. Note: This parameter is not shown if parameter ‘Modbus TCP Slave‘ is set to ‘Off’.

Range/Alternatives <default value>	Explanation and result of alternatives

Menu ‘Fieldbus’

Note: The Fieldbus menu is not shown if parameter ‘Fieldbus‘ (in Hardware Config menu) is set to ‘Not In Use’. See chapter ‘Communication – Fieldbus interface’ for more details on fieldbus configuration and usage.

Address

Range 1 - 125 < 126 >	Profibus address setting. Note: This parameter is only shown if parameter ‘Fieldbus‘ (in Hardware Config menu) is set to ‘Profibus’.

Address

Range 0 - 63 < 63 >	DeviceNet address setting Note: This parameter is only shown if parameter ‘Fieldbus‘ (in Hardware Config menu) is set to ‘DeviceNet’.

Baudrate

125 kbps 250 kbps 500 kbps Auto < Auto >	Sets the baudrate for a DeviceNet type of module. Must be selected to suite the master. ***125 kbps:*** *Fixed baudrate 125 kbits/s.* ***250 kbps:*** *Fixed baudrate 250 kbits/s.* ***500 kbps:*** *Fixed baudrate 500 kbits/s.* ***Auto:*** *Auto setting 125 – 500 kbits/s.* Note: This parameter is only shown if parameter ‘Fieldbus‘ (in Hardware Config menu) is set to ‘DeviceNet’.

No of Data Block

Range 0 - 12 < 0 >	Sets the No of Data Blocks that should be mapped to the memory available from the fieldbus. Each Data Block is configurable.

Range/Alternatives <default value>	Explanation and result of alternatives

Block 1 Type

Not In Use
Sum/Difference
Output 1-2
Output 3-4
Output 5-6
Output 7-8
Input A-B Force
Input C-D Force
Input A-B Signal
Input C-D Signal
Level Status
Input Status
Output Status
Inp./Outp Status
AOUT 1-4 Value
AOUT 1-2 Value
AOUT 3-4 Value
< Not In Use >

Sets the data source for Data Block 1. Selections Sum/difference, Output 1-2, Output 3-4, Output 5-6, Output 7-8, Input A-B Force, Input C-D Force, Input A-B Signal and Input C-D Signal are values from the selected Function Block, which is set with parameter Block 1 FB. Function block values are sent together with Error code and Status.
See detailed description of Function Block in chapter 3.

Not In Use: *The memory area corresponding to this data block is not updated.*
Sum/Difference: *The Sum and Difference values are transmitted in this Data Block. Floating point or Integer format.*
Output 1-2: *Output 1 and Output 2 are transmitted in this Data Block. Floating point or Integer format.*
Output 3-4: *See description of Output 1-2 above.*
Output 5-6: *See description of Output 1-2 above.*
Output 7-8: *See description of Output 1-2 above.*
Input A-B Force: *Input A Force and Input B Force are transmitted in this Data Block. Floating point or Integer format.*
Input C-D Force: *Input C Force and Input D Force are transmitted in this Data Block. Floating point or Integer format.*
Input A-B Signal: *Input A Signal and Input B Signal are transmitted in this Data Block. Floating point or Integer format.*
Input C-D Signal: *Input C Signal and Input D Signal are transmitted in this Data Block. Floating point or Integer format.*
Level Status: *The status of all 32 levels in the instrument is transmitted in this Data Block. Floating point or Integer format.*
Input Status: *The status of all inputs in the instrument is transmitted in this Data Block. Floating-point format.*
Output Status: *The status of all outputs in the instrument is transmitted in this Data Block. Floating-point format.*
Inp./Outp Status: *The status of all inputs and all outputs in the instrument is transmitted in this Data Block. Integer format.*
AOUT1-4 Value: *The values of analog outputs 1 to 4 are transmitted in this Data Block. Floating-point format.*
AOUT1-2 Value: *The values of analog outputs 1 and 2 are transmitted in this Data Block. Integer format.*
AOUT3-4 Value: *The values of analog outputs 3 and 4 are transmitted in this Data Block. Integer format.*

Note: This parameter is only shown if parameter ‘No of Data Block‘ is set to 1 or greater.

Range/Alternatives <default value>	Explanation and result of alternatives
Block 1 Format	
Floating Point Integer < Floating Point >	Sets the Data Block 1 Format. ***Floating Point:*** *The Data Block data format is floating point.* ***Integer:*** *The Data Block format is integer.* Note: This parameter is only shown if parameter 'No of Data Block' is set to 1 or greater and parameter 'Data Block 1 Type' is set to 'Sum/Difference', 'Output 1-2', 'Output 3-4', 'Output 5-6', 'Output 7-8', 'Input A-B Force', 'Input C-D Force', 'Input A-B Signal', 'Input C-D Signal' or 'Level Status'
Block 1 FB	
1 2 3 4 5 6 7 8 < 1 >	Selects the source Function Block Number for Data Block 1. ***1****: The Data Block uses data from Function Block no 1.* ***2****: The Data Block uses data from Function Block no 2.* …. ***8****: The Data Block uses data from Function Block no 8.* Note: This parameter is only shown if parameter 'No of Data Block' is set to 1 or greater and parameter 'Data Block 1 Type' is set to 'Sum/Difference', 'Output 1-2', 'Output 3-4', 'Output 5-6', 'Output 7-8', 'Input A-B Force', 'Input C-D Force', 'Input A-B Signal' or 'Input C-D Signal'.
Block 2 Type	
	Sets the data source for Data Block 2. Note: This parameter is only shown if parameter 'No of Data Block' is set to 2 or greater. See 'Block 1 Type' for an explanation of the parameter.
Block 2 Format	
	Sets the Data Block 2 Format. Note: This parameter is only shown if parameter 'No of Data Block' is set to 2 or greater. See 'Block 1 Format' for an explanation of the parameter.
Block 2 FB	
	Selects the source Function Block Number for Data Block 2. Note: This parameter is only shown if parameter 'No of Data Block' is set to 2 or greater. See 'Block 1 FB' for an explanation of the parameter.

For an explanation on parameters for Data Blocks 3 to 12 see 'Block 1 Type', 'Block 1 Format' and 'Block 1 FB'. Note that the parameters are shown only if 'No of Data Block' is set equal to or greater than the Data Block number.

Range/Alternatives <default value>	Explanation and result of alternatives

Menus 'Level 1' – 'Level 32'

NOTE: There are 32 levels each with the following parameters described below.

Level 1 Source (- Level 32 Source)

Not in use
Sum
Difference
Output 1
Output 2
Output 3
Output 4
Output 5
Output 6
Output 7
Output 8
Input A Force
Input B Force
Input C Force
Input D Force
< Not in use >

Defines the signal to be supervised by the Level Supervisor. See detailed description of Function Block in chapter 3 for a detailed explanation of the different signals. The actual values of the respective signals are affected by the Function Block settings. The Function Block to use is selected with parameter Level 1 F.Block.

Not in use: *The level is not used. Any outputs set to work with this level will be off.*
Sum: *The level supervises the Sum.*
Difference: *The level supervises the Difference.*
Output 1: *The level supervises Output 1.*
Output 2: *The level supervises Output 2.*
Output 3: *The level supervises Output 3.*
Output 4: *The level supervises Output 4.*
Output 5: *The level supervises Output 5.*
Output 6: *The level supervises Output 6.*
Output 7: *The level supervises Output 7.*
Output 8: *The level supervises Output 8.*
Input A Force: *The level supervises the force of Input A.*
Input B Force: *The level supervises the force of Input B.*
Input C Force: *The level supervises the force of Input C.*
Input D Force: *The level supervises the force of Input D.*

Level 1 Mode (- Level 32 Mode)

Normal
Absolute
< Normal >

This parameter defines the mode of operation for the selected level supervisor.
Normal: *The level is active when the selected signal is above (more positive) the set level.*
Absolute: *The level is active when the absolute value of the selected signal is above (more positive) the set level.*

Note: This parameter is only shown if 'Level 1 Source' is not set to 'Not in use'.

Range/Alternatives <default value>	Explanation and result of alternatives

Level 1 F.Block (- Level 32 F.Block)

1 2 3 4 5 6 7 8	Defines which Function Block that will be supervised by the level. ***1:*** *The level is supervising Function Block number 1.* ***2:*** *The level is supervising Function Block number 2.* …. ***8:*** *The level is supervising Function Block number 8.*
<1>	Note: This parameter is only shown if 'Level 1 Source' is not set to 'Not in use'.

Level 1 Output (- Level 32 Output)

Active Above Active Below < Active Above >	This parameter defines the conditions for control of a possible used output. ***Active above:*** *The used output is activated as the supervised signal level is above the set level.* ***Active below:*** *The used output is activated as the supervised signal level is below the set level.* Note: This parameter is only shown if 'Level 1 Source' is not set to 'Not in use'.

Level 1 Hyst. (- Level 32 Hyst.)

Range: +/-999999 Unit: Measurement or Web Tension unit. < 2 >	Defines the hystereses range for the level. Positive value gives a hystereses range above the switch level, negative value gives a range below the switch level. Note: This parameter is only shown if 'Level 1 Source' is not set to 'Not in use'.

Level 1 Up Del. (- Level 32 Up Del.)

Range: 0-10.00 Unit: s < 0.00 >	Defines the Delay time for increasing signal. The level will switch when the supervised value has been above Level 1 value during the set delay time. Note: This parameter is only shown if 'Level 1 Source' is not set to 'Not in use'.

Level 1 Dn.Del. (- Level 32 Dn.Del.)

Range: 0-10.00 Unit: s < 0.00 >	Defines the Delay time for decreasing signal. The level will switch when the supervised value has been below Level 1 value during set delay time. Note: This parameter is only shown if 'Level 1 Source' is not set to 'Not in use'.

Range/Alternatives <default value>	Explanation and result of alternatives

Menus ‘Inputs Slot 1’ - ‘Inputs Slot 3’

NOTE: There are three possible sub menus, one for each slot. In each slot sub menu there are up to 8 possible inputs named 11 to 18 for slot 1, 21 to 28 for slot 2 and so on. Each input has the parameters described below. Note that input numbering below only show inputs belonging to slot 1. The ‘Inputs Slot X’ is only shown if there is a module with inputs selected for slot X. The number of displayed inputs is the number of inputs of the specific module selected in menu ‘Hardware Configuration’.

Input 11 Use (- Input 18 Use)

Not in use Zero < Not in use >	Defines the use of the internal digital inputs in the instrument. ***Not in use:*** *The input is not used.* ***Zero:*** *Input used for zero command.*

Input 11 F.Block (- Input 18 F.Block)

1 2 3 4 5 6 7 8 <1>	Selects which Function Block that should use this input. ***1:*** *Function Block number 1 uses the input.* ***2:*** *Function Block number 2 uses the input.* *….* ***8:*** *Function Block number 8 uses the input.* Note: This parameter is not shown if parameter ‘Input 11 Use’ is set to ‘Not in use’.

Range/Alternatives <default value>	Explanation and result of alternatives

Menus ‘Outputs Slot 1’ - ‘Outputs Slot 3’

NOTE: There are three possible sub menus, one for each slot. In each slot sub menu there are up to 8 possible outputs named 11 to 18 for slot 1, 21 to 28 for slot 2 and so on. Each output has the parameters described below. Note that output numbering below only show outputs belonging to slot 1. The ‘Outputs Slot X’ is only shown if there is a module, with outputs, selected for slot X. The number of displayed outputs is the number of outputs of the specific module selected in menu ‘Hardware Configuration’.

Outp. 11 Source (- Outp. 18 Source)

Not in use In Process Level < Not in use >	Defines the use of the internal digital outputs in the instrument. ***Not in use:*** *The output is not used.* ***In Process:*** *Active output means active ‘In process’.* ***Level:*** *Output activated by the Level.*

Output 11 Level (- Output 18 Level)

1	***1:*** *Level number 1 uses the output.*
2	***2:*** *Level number 2 uses the output.*
3	***3:*** *Level number 3 uses the output.*
….	….
30	***30:*** *Level number 30 uses the output.*
31	***31:*** *Level number 31 uses the output.*
32	***32:*** *Level number 32 uses the output.*
<1>	Note: this parameter is only shown if parameter ‘Output 11 source’ is ‘Level’.

Range/Alternatives <default value>	Explanation and result of alternatives

Menu ‘Analog Outputs’

NOTE: There are 4 possible analog outputs each with the parameters described below. If the selected analog output module is AOUT4 there will be parameters for four analog outputs displayed, if the AOUT1 is selected only the parameters for the first analog output (shown below) will be shown. If no AOUT module at all is selected the menu ‘Analog Outputs’ will not be shown.

AOUT1 Source (- AOUT4 Source)

Not in use Sum Difference Output 1 Output 2 Output 3 Output 4 Output 5 Output 6 Output 7 Output 8 Input A Force Input B Force Input C Force Input D Force < Not in use >	Defines the value, from the selected Function Block, output on analog output 1. See detailed description of Function Block in chapter 3 for a detailed explanation of the different signals. The actual values of the respective signals are affected by the Function Block settings. ***Not in use:*** *The analog output is not used.* ***Sum:*** *The Sum value is output on Analog Output 1.* ***Difference:*** *The Difference value is output on Analog Output 1.* ***Output 1:*** *Output 1 value is output on Analog Output 1.* ***Output 2:*** *Output 2 value is output on Analog Output 1.* ***Output 3:*** *Output 3 value is output on Analog Output 1.* ***Output 4:*** *Output 4 value is output on Analog Output 1.* ***Output 5:*** *Output 5 value is output on Analog Output 1.* ***Output 6:*** *Output 6 value is output on Analog Output 1.* ***Output 7:*** *Output 7 value is output on Analog Output 1.* ***Output 8:*** *Output 8 value is output on Analog Output 1.* ***Input A Force:*** *The force value of Input A is output on Analog Output 1.* ***Input B Force:*** *The force value of Input B is output on Analog Output 1.* ***Input C Force:*** *The force value of Input C is output on Analog Output 1.* ***Input D Force:*** *The force value of Input D is output on Analog Output 1.*

Range/Alternatives <default value>	Explanation and result of alternatives

AOUT1 F.Block (- AOUT4 F.Block)

1 2 3 4 5 6 7 8 < 1 >	***1:** Function Block number 1 uses this analog output.* ***2:** Function Block number 2 uses this analog output.* …. ***8:** Function Block number 8 uses this analog output.* Note: This parameter is not shown if parameter 'AOUT 1 Source' is set to 'Not in use'.

AOUT1 Outp.Type (- AOUT4 Outp.Type)

+/- 20 mA -12 – 20 mA 0–20 mA 4–20 mA +/-10 V 0–10 V <4–20 mA>	Defines the type of signal, used to represent the value at this Analog output. ***+/-20mA, -12 – 20mA:** bipolar current output.* ***0 – 20mA, 4 – 20mA:** monopolar current output.* ***+/-10V:** bipolar voltage output.* ***0 – 10V:** monopolar voltage output.* Note that in most cases there are some over range available. +/-20 mA and –12–20 mA ranges are limited at -22 and +22 mA. 4–20 mA range is limited at +4 and +22 mA. 0–20 mA is limited at 0 and +22 mA. +/-10 V is limited at -11 and +11V. 0–10 V is limited at 0 and +11V. Note: This parameter is not shown if parameter 'AOUT 1 Source' is set to 'Not in use'.

AOUT1 Range Low (- AOUT4 Range Low)

Range: +/–999999 Unit: Measurement or Web Tension unit <0>	Defines the value that should give the lowest output (0 V / 0 mA / 4 mA) at this Analog output. Note: This parameter is not shown if parameter 'AOUT 1 Source' is set to 'Not in use'.

AOUT1 Range High (- AOUT4 Range High)

Range: +/–999999 Unit: Measurement or Web Tension unit <500>	Defines the value that should give the highest output (10 V / 20 mA) at this Analog output. Note: This parameter is not shown if parameter 'AOUT 1 Source' is set to 'Not in use'.

Range/Alternatives <default value>	Explanation and result of alternatives

AOUT1 Bandwidth (- AOUT4 Bandwidth)

1.6 Hz 3 Hz 6 Hz 12 Hz 25 Hz 50 Hz 100 Hz 200 Hz 400 Hz <100 Hz>	Sets the analog output bandwidth. Note: This parameter is not shown if parameter 'AOUT 1 Source' is set to 'Not in use'.

AOUT1 Low Adj. (- AOUT4 Low Adj.)

Range: +/-2.000 Unit: % <0.000>	Gives a possibility to adjust the offset of the analog output. This allows for the reading of an external instrument connected to the analog output to be fine-tuned. Full adjustment range corresponds to approximately +-2% of maximum analog output. The parameter value will be set to zero each time 'AOUT 1 Output Type' is changed. Note: This parameter is not shown if parameter 'AOUT 1 Source' is set to 'Not in use'.

AOUT1 High Adj. (- AOUT4 High Adj.)

Range: +/-2.000 Unit: % <0.000>	Gives a possibility to adjust the gain of the analog output signal. This allows for the reading of an external instrument connected to the analog output to be fine-tuned. Full adjustment range corresponds to approximately +-2% of maximum analog output. The parameter value will be set to zero each time 'AOUT 1 Output Type' is changed. Note: This parameter is not shown if parameter 'AOUT 1 Source' is set to 'Not in use'.

Range/Alternatives <default value>	Explanation and result of alternatives

Menu ”Program Options”

This sub menu shows all available program options. Program options must be activated with an option code to be functional. The option code can be purchased from your instrument supplier.

To temporarily use the program option, enter the string ‘Demo’ (irrespective of upper/lower case). This will allow to use the option for 14 days e.g. for try out.

Enter a ‘–’ to turn off the program option.

The program option can be used for several short periods but after a total use of 14 days it will be permanently turned off until a valid code is entered.

03: EtherNet/IP

< – >	The option code necessary to activate the EtherNet/IP program option always consists of 10 digits. If the EtherNet/IP Program option is activated please refer to the separate manual ‘G6 Multi Channel Force Instrument, EtherNet/IP Program option, Technical Manual Supplement’ for details.

Program options

A program option is a program functionality that must be purchased separately. It is not available until a valid option code is entered. An option code can be purchased at the same time as the instrument or separately at a later occasion. The program option code is directly related to the individual S/N of the CPU module. When ordering an option code it must be defined which CPU S/N it should apply to.

There is a possibility to use a program option for a limited time without an option code. This can be of use e.g. if the user would like to try out a program option, if a CPU is replaced and a new option code has not yet been acquired, etc.

Entering the text ”Demo” as the option code will give the user access to the program option during 14 days. After this period has expired a valid option code must be entered if the program option should be used. It is possible to disable demo mode if it is not used continuously. Entering a ”-” instead of option code or ”Demo” will disable the program option. The 14-day period is only counted when demo mode is enabled. If the 14-day period has expired the text ”Demo Expired” is shown which indicates that the demo mode is no longer available.

In the sub menu ”Program Options” are all available program options shown.

In the standard force program described in this manual is the EtherNet/IP available as a program options.

In other standard programs and special program there might be other program options available.

If a program option is enabled in demo mode there will be an indication in the function block display.

5. Calibration

General

When measuring with the G6 Instrument, the transducer output signal, corresponding to the transducer load, is converted to a force value. The conversion is controlled by several parameters with values defined during calibration of the individual Function Blocks.

The G6 Instrument supports two calibration types:

- **Table calibration -** entry of values from transducer data sheet(s) or entry of recorded values from a previous calibration.
  Table calibration can be performed without any transducers connected.
- **Known force calibration -** storing of measured transducer signals for known forces.

Calibration can only be performed in menu:
'Param. Set-up/Calibration/Function Block X.'

A 'Set-up code' or 'Operator code' may be demanded. Note that the measured force value for the calibrated Function Block may be temporarily incorrect during calibration.
A new calibration starts as a calibration type is selected.

To ensure the best possible measuring results, the mechanical installation must be carried out with great care. If an input has several transducers connected in parallel, they must have the same rated load and impedance. If transducers and fixed supports are combined, the load must be evenly distributed on all supports.

Load Cell

Type:	KIS-1R	Rated Load:	50 kN
Serial No:	378210	Over Load Safe:	100% R.L.
Part No:	1157652	Over Load Ultimate:	200% R.L.
		Side Load Safe:	100% R.L.
		Side Load Ultimate:	200% R.L.

Electrical

Electrical Connection SHIELDED 4-CONDUCTOR CABLE

Signal Positive:	WHITE WITH GREEN STRIPE	Excitation Positive:	GREEN WITH RED STRIPE
Signal Negative:	RED WITH WHITE STRIPE	Excitation Negative:	BLACK

Excitation Voltage (Recommended):	10 V AC OR DC
Excitation Voltage (Maximum):	18 V AC OR DC
Input Resistance:	349.55 Ω
Output Resistance:	349.65 Ω

Temperature

Range:	-40 TO +80°C
Compensated Range:	-10 TO +50°C
Effect On Output:	0.0015 % of Output/°C
Effect On Zero Balance:	0.003 % of R.O./°C

Performance

Rated Output (R.O.):	2.0439 mV/V
Non Linearity:	0.0211 % R.O.
Zero Balance:	0.1889 % R.O.
Creep 5 Minutes:	0.0039 % R.O.

Calibration Values (Tolerance 0.1%)

Shunt Resistor Connected Between Excitation Negative And Signal Negative

40 kΩ Corresponds To:	49.942 kN
80 kΩ Corresponds To:	25.039 kN

Each transducer from BLH Nobel is delivered with a detailed data and calibration sheet

If the G6 Instrument must be replaced, a table calibration of the replacement unit can be performed, with recorded values from an earlier calibration.

To get the best accuracy, a ‘Known Force’ calibration with known force to at least 2/3 of the used range, should be performed.

All calibration parameters are found in the menus under ‘Function Block X’. The parameters are described in chapter ‘Set-up’.

Note that calibration must be done separately for each input of each Function Block in the instrument.

A VIEWPAN instrument will display actual force value and transducer signal for each used input when in menu ‘Calibration Function Block X’. Force and transducer signals are shown ‘after’ the last parameter in the menu.

Common parameters

For both calibration types measurement unit and resolution for the force value must be set. These parameters apply to all inputs (input A – D) for the current Function Block. The parameters, among others, are found in menu ‘Function Block X’. This section deals only with the calibration parameters.

X:Measurem. Unit
This parameter defines the unit used for the force value. The same unit will also be used for related set-up parameters.

X:Resolution
This parameter defines decimal point position and resolution for the force value. The decimal point position selected here will be used in set up, in the displayed force value and in the force value sent to a computer. Resolution is understood to mean the smallest force change presented.

To ensure a stable force display, it is recommended that the input signal to the instrument should exceed 0.2 μV / resolution increment.

Calibrating using datasheet

When calibrating with data given in the transducer data sheet the ‘Table calibration’ method should be used. Note that there are two different ways that the transducer characteristics may be described in a data sheet. Choose the appropriate method below.

There are parameters for each input that are used with the current configuration for the Function Block being calibrated. Function Blocks can be 1 channel (Input A), 2 channel (Input A - B) or 4 channel (Input A - D) type. Note that only input channel A parameters are shown in the text below.

The transducer characteristics is given as two (or more) load / transducer output value pairs:

X:A ValueCal. P1:
Enter first calibration point load value, expressed in the measurement unit, (usually zero) in this parameter. The live load is displayed when the enter button is pressed. Press the enter button a second time to enter the X:A ValueCal.P1 value.

X:A T.Signal P1:
Enter first calibration point transducer output value, in mV/V, in this parameter.

X:A ValueCal. P2:
Enter last calibration point load value, expressed in the measurement unit, (usually nominal load) in this parameter. The live load is displayed when the enter button is pressed. Press the enter button a second time to enter the X:A ValueCal.P2 value.

X:A T.Signal P2:
Enter last calibration point transducer output value, in mV/V, in this parameter.

The change of transducer output in mV/V is given for a load change, usually corresponding to the transducer nominal load:

X:A ValueCal. P1:
Enter zero in this parameter. The live load is displayed when the enter button is pressed. Press the enter button a second time to enter the X:A ValueCal.P1 value.

X:A T.Signal P1:
Enter zero in this parameter.

X:A ValueCal. P2:
Enter the given load value, expressed in the measurement unit, in this parameter. This value is usually nominal load. The live load is displayed when the enter button is pressed. Press the enter button a second time to enter the X:A ValueCal.P2 value.

X:A T.Signal P2:
Enter the datasheet mV/V value, corresponding to the given load change, in this parameter. This value is often called Rated Output. See the example of ‘Data and Calibration Sheet’ shown under section General in this chapter.

After entering the four parameters above the gradient of the force input is defined. Next step is to zero the input:

X:A Set Zero
Set zero is useful only when the installation is finished. By the digit keys this value can be set to zero, for an unloaded input, or to the force of the known load for a loaded input. Note that unloaded means when the display should show zero.

The live load is displayed when the enter button is pressed. Press the enter button a second time to edit the zeroing value.

X:A Zero Offset
This parameter is used for entry of the recorded zero offset value from a previous calibration. If a zeroing has been performed with parameter ‘Set zero’ above, the value of parameter ‘Zero offset’ need not be changed.

Repeat the calibration for all inputs used in the current Function Block.

Using parameter values from a previous calibration

When calibrating with data from a previous calibration the ‘Table calibration’ method should be used. This is performed by entry of recorded force values and corresponding transducer signal values into the instrument. The accuracy of the copying procedure is 0.005 %.

There are parameters for each input that are used with the current configuration for the Function Block being calibrated. Function Blocks can be 1 channel (Input A), 2 channel (Input A - B) or 4 channel (Input A - D) type. Note that only input channel A parameters are shown in the text below.

X:A ValueCal.P1, X:A ValueCal.P2
These parameters are used for entry of recorded force values, expressed in the measurement unit, from a previous calibration. The live load is displayed when the enter button is pressed. Press the enter button a second time to enter the value.

X:A T.Signal P1, X:A T.Signal P2
These parameters are used for entry of recorded transducer signal values for corresponding calibration points.

X:A Set Zero
Set zero is useful only when the installation is finished. By the digit keys this value can be set to zero, for an unloaded input, or to the force of the known load for a loaded input. Note that unloaded means when the display should show zero.

The live load is displayed when the enter button is pressed. Press the enter button a second time to edit the zeroing value.

X:A Zero Offset
This parameter is used for entry of the recorded zero offset value from a previous calibration. If a zeroing has been performed with parameter ‘Set zero’ above, the value of parameter ‘Zero offset’ need not be changed.

IMPORTANT

Besides the Zero Offset parameter mentioned above there is also a zero correction value for each input of the Function Block. The zero correction values are stored, in non-volatile memory, when using the front panel Zero key or communication Zero function.

The zero correction values are reset (set to zero) when starting a new calibration procedure.

If the Zero key or the communication zeroing function have been used since the last calibration, a new zeroing must be done either by using the Set Zero calibration parameter described above or by using the front panel Zero function or the communication Zero function.

The front panel Zero function and the communication Zero function will zero all inputs of the Function Block.

The Set Zero parameter only zero the corresponding input and the user must repeat zeroing for all configured inputs of the Function Block.

Calibration with known forces

When calibrating with known forces applied to the transducers the ‘Known Force calibration’ method should be used. This is normally the most accurate calibration type. The transducer signals are measured and automatically stored when the input is loaded with known force. Calibration of the lowest point is normally performed with the transducers unloaded (with only fixed tare applied).
The second point should be placed as high as possible. It is recommended to load with at least 2/3 of the used range.

There are parameters for each input that are used with the current configuration for the Function Block being calibrated. Function Blocks can be 1 channel (Input A), 2 channel (Input A - B) or 4 channel (Input A - D) type. Note that only input channel A parameters are shown in the text below.

X:A ValueCal.P1
This parameter defines the force for the lowest calibration point. Normally the transducers should be unloaded and the parameter value set to 0 (zero). This force value and the corresponding transducer signal value are automatically stored in the instrument.

The live load is displayed when the enter button is pressed. Press the enter button a second time to enter the X:A ValueCal.P1 value.

X:A ValueCal.P2
The transducers should be loaded with known forces. These parameters show the load according to the previous calibration and the parameter values should be changed to the value of the known forces. As a parameter value is stored, the instrument will also store the corresponding transducer signal value for that calibration point.

The live load is displayed when the enter button is pressed. Press the enter button a second time to enter the X:A ValueCal.P2 value.

X:A T.Signal P1, X:A T.Signal P2
These parameters contain the automatically stored transducer signal values for the calibration points. The values cannot be edited.

X:A Set Zero
Set zero is useful only when the installation is finished. By the digit keys this value can be set to zero, for an unloaded input, or to the force of the known load for a loaded input. Note that unloaded means when the display should show zero.

The live load is displayed when the enter button is pressed. Press the enter button a second time to edit the zeroing value.

X:A Zero Offset
For a ready installation this parameter shows the zero offset after zeroing, a value that should not be edited.

6. Operation

General

This version of G6 instrument with strain gauge transducers is designed mainly for force and web tension purposes. The measurement values are displayed at the front panel, and can also be transmitted to a master computer/PLC.
The measurement values can also be presented as the output signal from an analog output module.
Some functions in the instrument can be controlled by digital input signals, and digital outputs from the instrument can be used to indicate actual status of instrument, function blocks, levels and so on. The number of inputs and outputs may be expanded by connection of additional I/O modules.

Power supply

The instrument is powered by 24 VDC and should not be turned off during weekends and over-night. The instrument uses the 24VDC power supply in the VIEWPAN module. Continuous power supply to electronics and transducers prevents moisture condensation in the units.

Power-up sequence

As the G6 instrument is started it enters the Starting up state.

If any error is detected during power-up, the sequence stops and an error code will be displayed. If the error is not fatal it will be possible to enter the menu system to correct possible set-up errors.

If the detected error is fatal, it will only be possible to select restart unless the error is a database file problem. If the start-up error is a database file error it will be possible to select between deleting the database file, entering program upgrade or restart. Deleting the database or upgrading the program (also upgrading to the present program version) will result in a new database to be created which may make the instrument usable again. Note that settings will be default after creating a new database. If the fatal error persists please contact your supplier.

If no errors are detected, the instrument can enter normal operation (automatic start-up), displaying actual force/web tension values.

If ‘Manual start-up’ is selected, the instrument enters the ‘Wait for start’ state, displaying a message ‘Manual start, Push any key’. When the operator presses any button the instrument will switch over to normal operation.

Operating display

VIEWPAN module

In the operating display it is possible to display force/web tension information from one function block at a time.

The upper display row shows the function block number followed by the sum value (force or web tension) and the unit.

If the selected function block is a two or four channel function block then the second row will display the difference value. No unit is displayed for the difference value, but its unit is the same as for the sum.

If a program option is enabled in demo mode there will be an indication on the display, 'DEMO'.

The ViewPan '+' and '–' keys are used to toggle between the available function blocks.

By pressing the '↑' key additional functions for the selected function block are displayed.

The ViewPan '+' and '–' keys are used to toggle between the available functions.

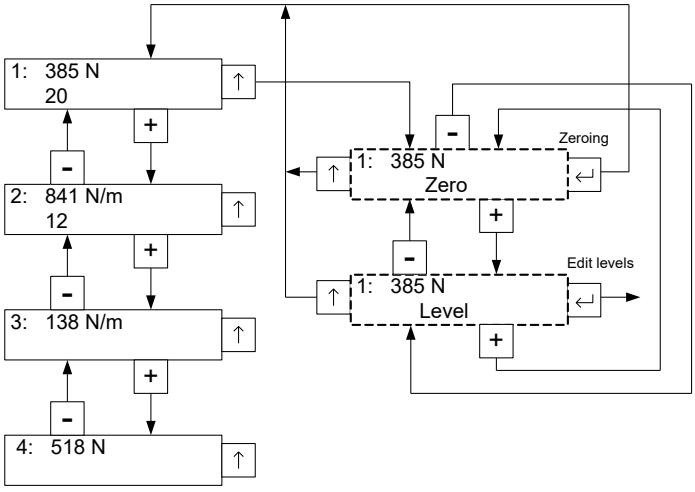
Pressing the '↑' key will return to the operating display for the actual function block.

Available functions are:

Zeroing: the text Zero is displayed on the lower text row of the display when zeroing function is available.

Levels: Showing and changing the levels that are assigned to the current function block. Not shown unless levels are assigned to the function block.

Pressing the '↵' key when a function text is displayed will activate that function. Note that the settings will affect available options/functions.



ViewPan operating menu, selection of function block. Note that all function blocks have the sub menu shown for function block 1 in the figure

Security locks

In the G6 instrument two security locks are included to prevent unauthorised access to the instrument via the panel keys. The locks can be activated by parameters in menu ‘Main menu/Param. Set-up/General’.

The following requires a login password if the corresponding lock is on.

Changing instrument clock:	Operator lock.
Changing Levels:	Operator lock.
Changing set-up parameters:	Set-up lock (Operator lock).
Entering/using Backup Menu:	Set-up lock (Operator lock).
Entering/using Restore Menu:	Set-up lock (Operator lock).
Entering/using Default Menu:	Set-up lock (Operator lock).
Entering/using Program Upgrade Menu:	Set-up lock (Operator lock).
Entering/using File handling Menu:	Set-up lock (Operator lock).
Changing values in Diagnostics menus:	Set-up lock (Operator lock).
Changing Network Config:	Set-up lock (Operator lock).

Entering set-up code gives access also to operator locked functions. If only operator lock is on, the operator code is required where set-up lock is specified above.

Unlocking of “Levels” editing from the main picture, is valid until you return to the main picture.

Unlocking of any function under the Main Menu, is valid until you leave the Main Menu.

There is also a protection from local and remote users both changing parameters. See chapter ‘Remote Access’ section ‘Remote / Local Access’ for more information.

Codes for the security locks

When a security lock is activated the operator must enter a four digit code to get access to the protected area. By default the valid code for both locks is ‘1 9 3 7’ , but the locks are not activated.
In menu ‘Param. Set-up’, sub menu ‘General’, parameters are available to activate the locks and to change the default code to any four-digit code.

The code for the Operator lock can only open the Operator lock.

The code for the Set-up lock will open both Set-up lock and Operator lock.

Zero setting

A basic zero setting of the force of each individual input is performed as part of the calibration for a function block. If changes to the equipment are made later a renewed calibration, or at least the zero setting of a calibration, should be performed.

Correction of the zero value may be needed and can rapidly be performed. Pressing the zeroing key sequence, see section ‘Operating display’, will set the forces of all used input channels for the selected Function Block to zero (providing that the ZERO key is enabled in the set-up).

Main menu

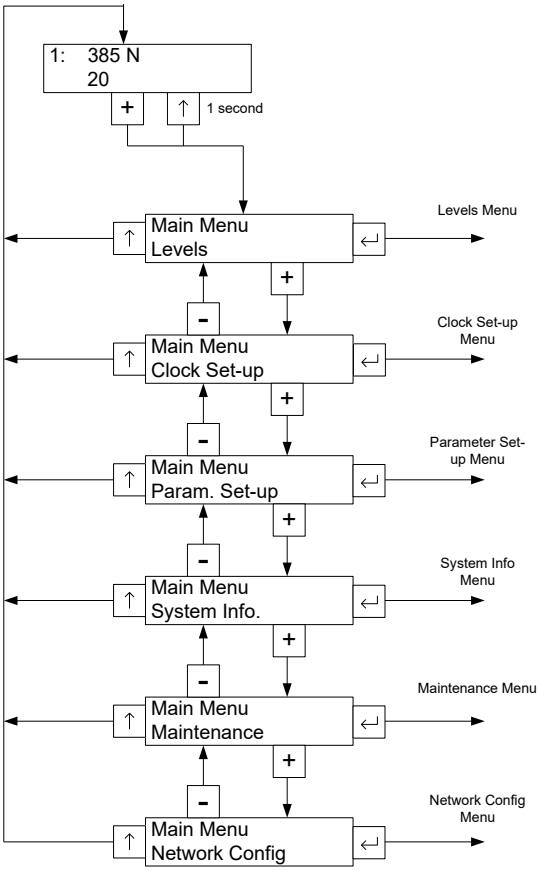
The instrument uses the VIEWPAN module located in the I/O slot system of the instrument as operator interface.

From any of the operating menu views, displaying the main menu is done by pressing '+' and '↑' keys simultaneously for 1 second.

The ViewPan '+' and '–' keys are used to scroll between the available menu items and the '↵' key is used to enter the selected sub menu. Pressing the '↑' key will make the instrument display the operating menu.

The instrument Main menu can be opened without interrupting the measuring operation.

In the Main menu it is possible to select between the following sub menus:



VIEWPAN main menu

Levels: Viewing and editing of level value for each configured Level Supervision function. Note that configuration of Level Supervision functionality is done in the 'Param. Set-up' menu.

Clock Set-up: Used to set the instrument clock and date. Time and Date formats are set-up with parameters trough 'Param. Set-up' menu.

Param. Set-up: Access to the G6 instrument parameter set-up menu system. See chapter 'Set-up' for more details on setup.

System Info: Displaying system information for hardware and software in the instrument. Program versions, database version, serial numbers and software versions for all electronic modules can be read here. Info about the Ethernet connection is also available.

Maintenance: Includes a number of functions for maintenance purposes. The available functions are Diagnostics, File Handling, Create Backup, Restore Backup, Set Default Values, Program Upgrade and Instr. Restart.
See chapter 'Maintenance' for a detailed description of the functions.

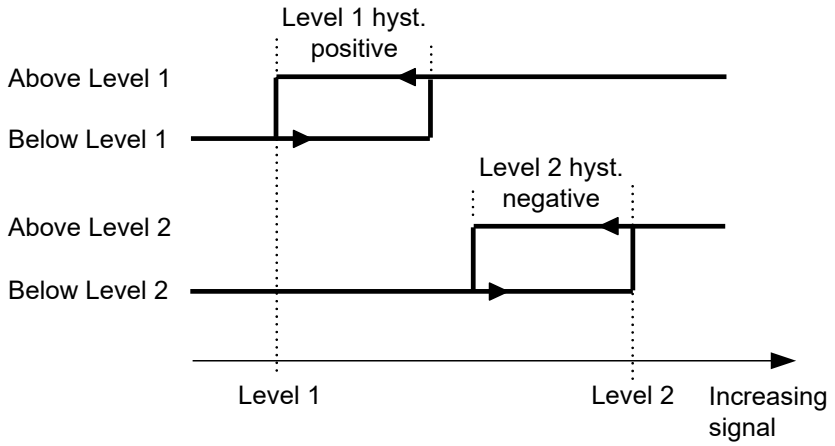
Network Config.: The Network Configuration menu consists of the IP Config. and the Server Config. menus. The IP Config. menu is used to set, manual/auto IP address assignment, IP address etc. The Server Config. menu is used to enable/disable the FTP Server and the WEB Server of the instrument. In this menu is also the password for the servers set.
Note that Ethernet configuration is not done with set-up parameters and is for that reason not saved with the instrument back-up function.

To return to the operating menu press the '↑' key.

Level supervision

The G6 instrument contains 32 supervision Levels that can be used to supervise defined signals in the instrument. Digital outputs can be connected as outputs for the Levels. The properties for each Level are configured by set-up parameters.

Functions for Level supervision are defined in menu ‘Param. Set-up’ by parameters in the sub menus ‘Level Superv.’ and ‘Outputs’. See chapter Set-up.



Influence on the level supervision from positive hysteresis, for Level 1, and negative hysteresis, for Level 2

‘Level X Source’

Set to ‘Not in use’ will disable level X.

Select the signal that should be supervised by level X.

‘Level X Mode’
This parameter selects if the level should supervise the absolute value of the signal. Note that if ‘Absolute’ is selected and the set level is negative, the level will always be active regardless off the actual value off the signal.

‘Level X F.Block
The parameter ‘Level X F. Block’ is set to the Function Block no (1 – 8) that the supervision level shall supervise.

‘Level X Output’
Defines how a digital output, if connected to the Level, should operate.
The parameter can be set to make an output active when the signal is above the Level, or when it is below the Level.

‘Level X Hyst.’
Defines the width of a hystereses range for the Level. The definition of a negative hystereses range starts with a minus sign(-).
Hystereses is an intentional difference between the switch levels for increasing and decreasing signal level. One switch level is always at the defined Level. The other switch level is at a higher level by positive hystereses, at a lower level by negative hystereses. See figure.

‘Level X Up Del.’
Defines the Delay time for increasing signal. The level will switch when the supervised value has been above Level X value during the set delay time. It is possible to use delay and hystereses concurrently, but it is recommended to set the hystereses to zero when the ‘Level X Up Del.’ is used.

‘Level X Dn.Del.’
Defines the Delay time for decreasing signal. The level will switch when the supervised value has been below Level X value during the set delay time. It is possible to use delay and hystereses concurrently, but it is recommended to set the hystereses to zero when the ‘Level X Dn.Del.’ is used.

Level status
Actual status of the Levels (input signal above or below Level) can be read via communication.
The level status includes the influence from hystereses and delays, but it does not show the status of any digital outputs, connected to the Levels.

Use of inputs and outputs

Internal I/O’s are included on some of the I/O-modules that the G6 instrument can be equipped with. Different module types have different number of inputs and outputs. A DIO8 module have 8 inputs and 8 outputs while the force conversion modules HSWF2, WFIN and WFIN2 each have 4 inputs and 2 outputs.
All input and output functions are controlled by set-up parameters in the instrument.

Digital inputs

The digital inputs can be used for remote operation of the instrument.

Digital outputs

The digital outputs can be used for control of external equipment and for indication of instrument status.

Analog outputs

To produce analog outputs from the G6 instrument, a one channel AOUT1 or a four channel AOUT4 module is used.

The analog output signal will represent a selected signal in the instrument in form of an analog current or voltage signal. All analog output functions are defined by parameters in sub menu ‘Analog outputs’, see chapter ‘Set-up’.

Filter function

In the instrument the measured values are filtered according to the settings chosen by the user during set-up. The filter settings can be selected from a wide range. This means that the instrument can be configured from very stable indication to more fast response but with less stable readings depending on the demands from the actual application. Note that the same filter setting apply to all inputs (A – D) in a function block.

The user must consider the effects of different settings on the application. Choosing a lower update rate will generally speaking give a more stable reading and may be used when an operator should make a visual reading of the measuring value. A faster update rate is typically selected when the instrument is used for closed loop control or data logging/recording of fast processes.

When using the measured value, as feedback in a closed loop system great care must be taken when choosing the filter settings. The overall phase shift in the loop has a crucial influence on the stability. The measuring filter and the analog output filter both give a contribution to the total loop phase shift. If communication is used to acquire measuring value from the instrument, the delays and update rate in the network or on the serial communication line, must also be taken into account when designing a closed loop system.

Filter characteristics

The parameters ‘HSWF Update R.’ / ‘WFIN Update R.’ selects the update rate and filter characteristics of the measuring value. HSWF2 and WFIN / WFIN2 modules have different ranges of settings.

With the ‘WFIN Update R.’ parameter set to ‘300 Hz ++’ the update rate will be 300 Hz (i.e. same as ‘300 Hz’) but the filter has been optimized for high bandwidth, and less phase shift, rather than effective damping. This also applies to ‘HSWF Update R.’ parameter when set to ‘800 Hz ++’ (using 800 Hz update rate). In both these cases the user must consider the risk of aliasing. Avoid using these high bandwidth settings (800 Hz ++ / 300 Hz ++) if excessive noise exists.

The figures in the tables below include the influence of the analog output filtering set to 400 Hz filtering bandwidth. Setting the analog filter bandwidth to a lower value will reduce the frequency values in the tables. See Analog output filter table below.

WFIN / WFIN2 module filter

Update rate (fs)	- 3 dB damping frequency	Damping at frequencies ≥ fs / 2	-40° phase shift frequency
300 Hz ++	63 Hz	≥ 20 dB	11 Hz
300 Hz	22 Hz	≥ 90 dB	4.5 Hz
150 Hz	14 Hz	≥ 90 dB	2.3 Hz
75 Hz	7.6 Hz	≥ 90 dB	1.2 Hz
37 Hz	3.9 Hz	≥ 90 dB	0.60 Hz
19 Hz	2 Hz	≥ 90 dB	0.30 Hz
9.3 Hz	1 Hz	≥ 90 dB	0.15 Hz

Note: fs is the update rate.

HSWF2 module filter

Update rate (fs)	- 3 dB damping frequency	Damping at frequencies ≥ fs / 2	-40° phase shift frequency
800 Hz ++	87 Hz	≥ 20 dB	21 Hz
800 Hz	48 Hz	≥ 90 dB	10 Hz
400 Hz	34 Hz	≥ 90 dB	5.5 Hz
200 Hz	19 Hz	≥ 90 dB	2.9 Hz
100 Hz	10 Hz	≥ 90 dB	1.5 Hz
50 Hz	5.2 Hz	≥ 90 dB	0.8 Hz
25 Hz	2.6 Hz	≥ 90 dB	0.4 Hz

Note: fs is the update rate.

WFIN / WFIN2 Filter rise time

Update rate	
300 Hz ++	0.020 s
300 Hz	0.040 s
150 Hz	0.080 s
75 Hz	0.16 s
37 Hz	0.32 s
19 Hz	0.64 s
9.3 Hz	1.3 s

HSWF2 Filter rise time

Update rate	
800 Hz ++	0.010 s
800 Hz	0.015 s
400 Hz	0.030 s
200 Hz	0.060 s
100 Hz	0.12 s
50 Hz	0.24 s
25 Hz	0.48 s

Rise time is defined as the time from an ideal step input to output reaches 99 % of the input step. Note that in reality no input changes will be an ideal step. Input signals are affected by mechanical time constants and how the force is applied to the transducer.

Analog output filter

Update rate	- 3 dB damping frequency	-40° phase shift frequency	Rise time (0 – 99 %)
400 Hz	400 Hz	130 Hz	0.0025 s
200 Hz	200 Hz	63 Hz	0.005 s
100 Hz	100 Hz	31 Hz	0.01 s
50 Hz	50 Hz	16 Hz	0.02 s
25 Hz	25 Hz	8.1 Hz	0.04 s
12 Hz	12 Hz	4.1 Hz	0.08 s
6 Hz	6 Hz	2.0 Hz	0.16 s
3 Hz	3 Hz	1.0 Hz	0.32 s
1.6 Hz	1.6 Hz	0.5 Hz	0.64 s

The table above, describing the analog output filter, does not include the measuring channel update rate, filter characteristics etc.

The instrument must be restarted when update rate has been changed.

7. Communication

General

The G6 Instrument has a serial communication port, one Ethernet port and an optional fieldbus module.

The serial communication port can be used for communication with a control unit.

The Ethernet port can be used for communication with a control unit and for file transfer to and from an external computer, using ftp (File Transfer Protocol). These functions can be used simultaneously.

The optional fieldbus interface module is used for communication with a control unit.

Serial interface

The instrument is equipped with a RS485 serial communication port for 2-wire or 4-wire. RS485 is an interface working with differential voltages, giving a noise resistant transmission in a network with several units and long distances. The host computer (master) must have an asynchronous communication port for RS485 or use a converter for RS232 to RS485 conversion or USB to RS485.

If 2-wire transmission is used, the control unit must be capable of data flow direction control or utilize a converter for automatic data flow direction control. When 4-wire transmission is used, no data flow direction control is needed.

Modbus RTU slave

General

All the G6 units connected to the network can listen to what is transmitted in the network, but only one unit at a time may transmit. A time-sharing principle is needed to allow communication in both directions (half duplex).

All communication in the network must be initiated by the control unit (master). When the instrument is working together with a master the instrument units are all slaves, only allowed to reply to master commands. As the master has addressed a command message to a specific slave unit, it listens for the reply during a specified time, before sending next command message.

If the reply from a slave unit fails it may be due to:

- Mismatch in communication parameters. (baud rate, address, . .)
- More than one slave unit has been transmitting at the same time. This can distort the reply message and make it impossible to decode.

See chapter ‘Communication – Modbus protocol’ section for detailed information of register numbering, register content definition, commands etc.

Setup of Modbus RTU communication

- The instrument will as default be given the address 1. If more than one instrument is used in a network, each G6 instrument must be given a unique address. This can be done only if the serial port is configured as a Modbus Slave. This is done by setting parameter ‘Mode’ to ‘Modbus Slave’ in menu ‘Param. Set-up’, ‘Communication’, ‘Serial Com.’. Then the parameter ‘Modbus Address’ can be changed.
- Select correct baud rate and data format in parameter ‘Baudrate’ and ‘Data Format’.
- Select wanted type of float values in parameter ‘Float Form.’.
- When longer response times are needed, set ‘Min Reply T’ to a suitable value.

Modbus TCP slave

General

The Ethernet communication port can be used to communicate with the instrument using the Modbus TCP protocol. The instrument is a Modbus TCP slave and will only respond to incoming messages from a master.

See chapter ‘Communication – Modbus protocol’ section for detailed information of register numbering, register content definition, commands etc.

Setup of Modbus TCP slave communication

- Network configuration (IP-address, netmask,….) must be done from menu ‘Network Config’.
- Enable the Modbus TCP Slave by setting parameter ‘Modbus TCP Slave’ to ‘On’ in menu ‘Param. Set-up / Communication / Ethernet’.
- Select wanted type of float values in parameter ‘Float Format’ (also in menu ‘Ethernet’).

EtherNet/IP

The Ethernet communication port can be used to communicate with the instrument using EtherNet/IP protocol. The optional EtherNet/IP interface is intended for accessing function block data including force values, input and output status, level status etc. Commands for zeroing of function block inputs can be issued over the EtherNet/IP interface.

The interface is not intended for set-up of the instrument. Use the instrument front panel user interface or the web interface for set-up.

See the separate manual ‘G6 Multi Channel Force Instrument, EtherNet/IP Program option, Technical Manual Supplement’ for a complete description on the EtherNet/IP interface.

Ftp server and file handling

The G6 instrument contains an ftp server that can be used to transfer files between the instrument and an external computer using an ftp client. To connect to the instrument the ftp client must login to the instrument with the user ID ‘G6User’ and the password ‘1937’ (default password). Note that the password for the ftp server and the web server can be set in the menu ‘Server Config.’. In this menu there are also settings for turning on or off the ftp server and web server. By default both ftp server and web server are turned on.

The ftp handling can be automatic, e.g. to collect log files once every 24 hours or manual.

The ftp client (on an external computer) can access the user area of the instrument flash file system. The user area consists of (by default) the InstrBackup, Misc, Recipes and LogFiles folders.

In the current instrument version the InstrBackup folder is used by default when creating backup files.

Modbus protocol

For communication with a master computer (PLC) the Modbus protocol is used in the instrument. The Modbus protocol is a standard protocol, used for master/slave communication in the industry.

Information is transmitted in blocks of data to minimise polling and response time delays. For example the error register, status register and sum register could be read with one command to the instrument.

When a command that cannot be performed is sent, the instrument responds with an exception code. For a better explanation of the error, a special command error register could be read.

Depending on the type of the communicating equipment (the master), the commands in the application programme (PLC programme, or pc programme) may be different from type to type. However, if the master is not a Modicon PLC system, then the Modbus implementation in the master must have some cross-reference function to transfer the Modbus register and I/O bit numbering to the masters own register and I/O bit numbering. All registers and coils described in this manual use the standard Modbus (Modicon) register and I/O numbering.
See the master's own Modbus driver documentation for how the commands should be activated in the master's application programme.

Most manufacturers of PLC systems and HMI and SCADA software can provide Modbus drivers. Various Modbus drivers for development of Windows programs are also available on the market.

General registers

The G6 instrument has a number of Modicon 'Holding Registers' (registers 4XXXX ...).
The Modbus function 03 'Read Holding Registers' should be used to read these registers and the Modbus function 05 'Preset Single Register' or 16 'Preset Multiple Registers' should be used to write to the registers.
See section ‘Data representation’ for a description of the different data formats used.

Hint: To find out which of the float formats that should be used, read the ‘Instrument type’ register (44000), which equals ‘6001’ for the instrument.

Register “Program number” shall equal “3” for standard Force application.

Data type: Integer	**Data type: float (2 reg./value)**	**Explanation**	**R/W**
40001 (1 reg)	44000	Instrument type	R
40002 (1 reg)	44002	Program number	R
40003 (1 reg)	44004	Program major version	R
40004 (1 reg)	44006	Program minor version	R
40006 (3 reg)	44010	Serial number	R
40030 (1 reg)	44030	Command error	R
40031 (1 reg)	44032	Instrument state	R
40032 (1 reg)	44034	Instrument error	R
40033 (1 reg)	44036	Instrument status	R
40034 (1 reg)	44038	Function Block 1: Error code	R
40035 (1 reg)	44040	Function Block 1: Status	R
40036 (3 reg)	44042	Function Block 1: Sum	R
40039 (3 reg)	44044	Function Block 1: Difference	R
40042 (3 reg)	44046	Function Block 1: Output 1	R
40045 (3 reg)	44048	Function Block 1: Output 2	R
40048 (1 reg)	44050	Function Block 2: Error code	R
40049 (1 reg)	44052	Function Block 2: Status	R
40050 (3 reg)	44054	Function Block 2: Sum	R
40053 (3 reg)	44056	Function Block 2: Difference	R
40056 (3 reg)	44058	Function Block 2: Output 1	R
40059 (3 reg)	44060	Function Block 2: Output 2	R

Data type: Integer	**Data type: float (2 reg./value)**	**Explanation**	**R/W**
40062 (1 reg)	44062	Function Block 3: Error code	R
40063 (1 reg)	44064	Function Block 3: Status	R
40064 (3 reg)	44066	Function Block 3: Sum	R
40067 (3 reg)	44068	Function Block 3: Difference	R
40070 (3 reg)	44070	Function Block 3: Output 1	R
40073 (3 reg)	44072	Function Block 3: Output 2	R
40076 (1 reg)	44074	Function Block 4: Error code	R
40077 (1 reg)	44076	Function Block 4: Status	R
40078 (3 reg)	44078	Function Block 4: Sum	R
40081 (3 reg)	44080	Function Block 4: Difference	R
40084 (3 reg)	44082	Function Block 4: Output 1	R
40087 (3 reg)	44084	Function Block 4: Output 2	R
40090 (1 reg)	44086	Function Block 5: Error code	R
40091 (1 reg)	44088	Function Block 5: Status	R
40092 (3 reg)	44090	Function Block 5: Sum	R
40095 (3 reg)	44092	Function Block 5: Difference	R
40098 (3 reg)	44094	Function Block 5: Output 1	R
40101 (3 reg)	44096	Function Block 5: Output 2	R
40104 (1 reg)	44098	Function Block 6: Error code	R
40105 (1 reg)	44100	Function Block 6: Status	R
40106 (3 reg)	44102	Function Block 6: Sum	R
40109 (3 reg)	44104	Function Block 6: Difference	R
40112 (3 reg)	44106	Function Block 6: Output 1	R
40115 (3 reg)	44108	Function Block 6: Output 2	R
40118 (1 reg)	44110	Function Block 7: Error code	R
40119 (1 reg)	44112	Function Block 7: Status	R
40120 (3 reg)	44114	Function Block 7: Sum	R
40123 (3 reg)	44116	Function Block 7: Difference	R
40126 (3 reg)	44118	Function Block 7: Output 1	R
40129 (3 reg)	44120	Function Block 7: Output 2	R

Data type: Integer	**Data type: float (2 reg./value)**	**Explanation**	**R/W**
40132 (1 reg)	44122	Function Block 8: Error code	R
40133 (1 reg)	44124	Function Block 8: Status	R
40134 (3 reg)	44126	Function Block 8: Sum	R
40137 (3 reg)	44128	Function Block 8: Difference	R
40140 (3 reg)	44130	Function Block 8: Output 1	R
40143 (3 reg)	44132	Function Block 8: Output 2	R
40150 (1 reg)	44150	Function Block 1: Error code	R
40151 (1 reg)	44152	Function Block 1: Status	R
40152 (3 reg)	44154	Function Block 1: Sum	R
40155 (3 reg)	44156	Function Block 1: Difference	R
40158 (3 reg)	44158	Function Block 1: Output 1	R
40161 (3 reg)	44160	Function Block 1: Output 2	R
40164 (3 reg)	44162	Function Block 1: Output 3	R
40167 (3 reg)	44164	Function Block 1: Output 4	R
40170 (3 reg)	44166	Function Block 1: Output 5	R
40173 (3 reg)	44168	Function Block 1: Output 6	R
40176 (3 reg)	44170	Function Block 1: Output 7	R
40179 (3 reg)	44172	Function Block 1: Output 8	R
40182 (3 reg)	44174	Function Block 1: Input A Force	R
40185 (3 reg)	44176	Function Block 1: Input B Force	R
40188 (3 reg)	44178	Function Block 1: Input C Force	R
40191 (3 reg)	44180	Function Block 1: Input D Force	R
40194 (3 reg)	44182	Function Block 1: Input A Signal (mV/V)	R
40197 (3 reg)	44184	Function Block 1: Input B Signal (mV/V)	R
40200 (3 reg)	44186	Function Block 1: Input C Signal (mV/V)	R
40203 (3 reg)	44188	Function Block 1: Input D Signal (mV/V)	R
40206 (1 reg)	44190	Function Block 2: Error code	R
40207 (1 reg)	44192	Function Block 2: Status	R
40208 (3 reg)	44194	Function Block 2: Sum	R
40211 (3 reg)	44196	Function Block 2: Difference	R
40214 (3 reg)	44198	Function Block 2: Output 1	R

Data type: Integer	**Data type: float (2 reg./value)**	**Explanation**	**R/W**
40217 (3 reg)	44200	Function Block 2: Output 2	R
40220 (3 reg)	44202	Function Block 2: Output 3	R
40223 (3 reg)	44204	Function Block 2: Output 4	R
40226 (3 reg)	44206	Function Block 2: Output 5	R
40229 (3 reg)	44208	Function Block 2: Output 6	R
40232 (3 reg)	44210	Function Block 2: Output 7	R
40235 (3 reg)	44212	Function Block 2: Output 8	R
40238 (3 reg)	44214	Function Block 2: Input A Force	R
40241 (3 reg)	44216	Function Block 2: Input B Force	R
40244 (3 reg)	44218	Function Block 2: Input C Force	R
40247 (3 reg)	44220	Function Block 2: Input D Force	R
40250 (3 reg)	44222	Function Block 2: Input A Signal (mV/V)	R
40253 (3 reg)	44224	Function Block 2: Input B Signal (mV/V)	R
40256 (3 reg)	44226	Function Block 2: Input C Signal (mV/V)	R
40259 (3 reg)	44228	Function Block 2: Input D Signal (mV/V)	R
40262 (1 reg)	44230	Function Block 3: Error code	R
40263 (1 reg)	44232	Function Block 3: Status	R
40264 (3 reg)	44234	Function Block 3: Sum	R
40267 (3 reg)	44236	Function Block 3: Difference	R
40270 (3 reg)	44238	Function Block 3: Output 1	R
40273 (3 reg)	44240	Function Block 3: Output 2	R
40276 (3 reg)	44242	Function Block 3: Output 3	R
40279 (3 reg)	44244	Function Block 3: Output 4	R
40282 (3 reg)	44246	Function Block 3: Output 5	R
40285 (3 reg)	44248	Function Block 3: Output 6	R
40288 (3 reg)	44250	Function Block 3: Output 7	R
40291 (3 reg)	44252	Function Block 3: Output 8	R
40294 (3 reg)	44254	Function Block 3: Input A Force	R
40297 (3 reg)	44256	Function Block 3: Input B Force	R
40300 (3 reg)	44258	Function Block 3: Input C Force	R
40303 (3 reg)	44260	Function Block 3: Input D Force	R
40306 (3 reg)	44262	Function Block 3: Input A Signal (mV/V)	R
40309 (3 reg)	44264	Function Block 3: Input B Signal (mV/V)	R

Data type: Integer	Data type: float (2 reg./value)	Explanation	R/W
40312 (3 reg)	44266	Function Block 3: Input C Signal (mV/V)	R
40315 (3 reg)	44268	Function Block 3: Input D Signal (mV/V)	R
40318 (1 reg)	44270	Function Block 4: Error code	R
40319 (1 reg)	44272	Function Block 4: Status	R
40320 (3 reg)	44274	Function Block 4: Sum	R
40323 (3 reg)	44276	Function Block 4: Difference	R
40326 (3 reg)	44278	Function Block 4: Output 1	R
40329 (3 reg)	44280	Function Block 4: Output 2	R
40332 (3 reg)	44282	Function Block 4: Output 3	R
40335 (3 reg)	44284	Function Block 4: Output 4	R
40338 (3 reg)	44286	Function Block 4: Output 5	R
40341 (3 reg)	44288	Function Block 4: Output 6	R
40344 (3 reg)	44290	Function Block 4: Output 7	R
40347 (3 reg)	44292	Function Block 4: Output 8	R
40350 (3 reg)	44294	Function Block 4: Input A Force	R
40353 (3 reg)	44296	Function Block 4: Input B Force	R
40356 (3 reg)	44298	Function Block 4: Input C Force	R
40359 (3 reg)	44300	Function Block 4: Input D Force	R
40362 (3 reg)	44302	Function Block 4: Input A Signal (mV/V)	R
40365 (3 reg)	44304	Function Block 4: Input B Signal (mV/V)	R
40368 (3 reg)	44306	Function Block 4: Input C Signal (mV/V)	R
40371 (3 reg)	44308	Function Block 4: Input D Signal (mV/V)	R
40374 (1 reg)	44310	Function Block 5: Error code	R
40375 (1 reg)	44312	Function Block 5: Status	R
40376 (3 reg)	44314	Function Block 5: Sum	R
40379 (3 reg)	44316	Function Block 5: Difference	R
40382 (3 reg)	44318	Function Block 5: Output 1	R
40385 (3 reg)	44320	Function Block 5: Output 2	R
40388 (3 reg)	44322	Function Block 5: Output 3	R
40391 (3 reg)	44324	Function Block 5: Output 4	R
40394 (3 reg)	44326	Function Block 5: Output 5	R
40397 (3 reg)	44328	Function Block 5: Output 6	R

Data type: Integer	**Data type: float (2 reg./value)**	**Explanation**	**R/W**
40400 (3 reg)	44330	Function Block 5: Output 7	R
40403 (3 reg)	44332	Function Block 5: Output 8	R
40406 (3 reg)	44334	Function Block 5: Input A Force	R
40409 (3 reg)	44336	Function Block 5: Input B Force	R
40412 (3 reg)	44338	Function Block 5: Input C Force	R
40415 (3 reg)	44340	Function Block 5: Input D Force	R
40418 (3 reg)	44342	Function Block 5: Input A Signal (mV/V)	R
40421 (3 reg)	44344	Function Block 5: Input B Signal (mV/V)	R
40424 (3 reg)	44346	Function Block 5: Input C Signal (mV/V)	R
40427 (3 reg)	44348	Function Block 5: Input D Signal (mV/V)	R
40430 (1 reg)	44350	Function Block 6: Error code	R
40431 (1 reg)	44352	Function Block 6: Status	R
40432 (3 reg)	44354	Function Block 6: Sum	R
40435 (3 reg)	44356	Function Block 6: Difference	R
40438 (3 reg)	44358	Function Block 6: Output 1	R
40441 (3 reg)	44360	Function Block 6: Output 2	R
40444 (3 reg)	44362	Function Block 6: Output 3	R
40447 (3 reg)	44364	Function Block 6: Output 4	R
40450 (3 reg)	44366	Function Block 6: Output 5	R
40453 (3 reg)	44368	Function Block 6: Output 6	R
40456 (3 reg)	44370	Function Block 6: Output 7	R
40459 (3 reg)	44372	Function Block 6: Output 8	R
40462 (3 reg)	44374	Function Block 6: Input A Force	R
40465 (3 reg)	44376	Function Block 6: Input B Force	R
40468 (3 reg)	44378	Function Block 6: Input C Force	R
40471 (3 reg)	44380	Function Block 6: Input D Force	R
40474 (3 reg)	44382	Function Block 6: Input A Signal (mV/V)	R
40477 (3 reg)	44384	Function Block 6: Input B Signal (mV/V)	R
40480 (3 reg)	44386	Function Block 6: Input C Signal (mV/V)	R
40483 (3 reg)	44388	Function Block 6: Input D Signal (mV/V)	R
40486 (1 reg)	44390	Function Block 7: Error code	R
40487 (1 reg)	44392	Function Block 7: Status	R

Data type: Integer	**Data type: float (2 reg./value)**	**Explanation**	**R/W**
40488 (3 reg)	44394	Function Block 7: Sum	R
40491 (3 reg)	44396	Function Block 7: Difference	R
40494 (3 reg)	44398	Function Block 7: Output 1	R
40497 (3 reg)	44400	Function Block 7: Output 2	R
40500 (3 reg)	44402	Function Block 7: Output 3	R
40503 (3 reg)	44404	Function Block 7: Output 4	R
40506 (3 reg)	44406	Function Block 7: Output 5	R
40509 (3 reg)	44408	Function Block 7: Output 6	R
40512 (3 reg)	44410	Function Block 7: Output 7	R
40515 (3 reg)	44412	Function Block 7: Output 8	R
40518 (3 reg)	44414	Function Block 7: Input A Force	R
40521 (3 reg)	44416	Function Block 7: Input B Force	R
40524 (3 reg)	44418	Function Block 7: Input C Force	R
40527 (3 reg)	44420	Function Block 7: Input D Force	R
40530 (3 reg)	44422	Function Block 7: Input A Signal (mV/V)	R
40533 (3 reg)	44424	Function Block 7: Input B Signal (mV/V)	R
40536 (3 reg)	44426	Function Block 7: Input C Signal (mV/V)	R
40539 (3 reg)	44428	Function Block 7: Input D Signal (mV/V)	R
40542 (1 reg)	44430	Function Block 8: Error code	R
40543 (1 reg)	44432	Function Block 8: Status	R
40544 (3 reg)	44434	Function Block 8: Sum	R
40547 (3 reg)	44436	Function Block 8: Difference	R
40550 (3 reg)	44438	Function Block 8: Output 1	R
40553 (3 reg)	44440	Function Block 8: Output 2	R
40556 (3 reg)	44442	Function Block 8: Output 3	R
40559 (3 reg)	44444	Function Block 8: Output 4	R
40562 (3 reg)	44446	Function Block 8: Output 5	R
40565 (3 reg)	44448	Function Block 8: Output 6	R
40568 (3 reg)	44450	Function Block 8: Output 7	R
40571 (3 reg)	44452	Function Block 8: Output 8	R
40574 (3 reg)	44454	Function Block 8: Input A Force	R
40577 (3 reg)	44456	Function Block 8: Input B Force	R
40580 (3 reg)	44458	Function Block 8: Input C Force	R

Data type: Integer	**Data type: float (2 reg./value)**	**Explanation**	**R/W**
40583 (3 reg)	44460	Function Block 8: Input D Force	R
40586 (3 reg)	44462	Function Block 8: Input A Signal (mV/V)	R
40589 (3 reg)	44464	Function Block 8: Input B Signal (mV/V)	R
40592 (3 reg)	44466	Function Block 8: Input C Signal (mV/V)	R
40595 (3 reg)	44468	Function Block 8: Input D Signal (mV/V)	R
40630 (3 reg)	44500	Analog output value 1	R
40633 (3 reg)	44502	Analog output value 2	R
40636 (3 reg)	44504	Analog output value 3	R
40639 (3 reg)	44506	Analog output value 4	R
40642 (1 reg)	44508	Status of inputs 11 - 18, 21 - 28	R
40643 (1 reg)	44510	Status of inputs 31 - 38, 41 - 48	R
40644 (1 reg)	44512	Status of inputs 51 - 58, 61 - 68	R
40645 (1 reg)	44514	Status of outputs 11 - 18, 21 - 28	R
40646 (1 reg)	44516	Status of outputs 31 - 38, 41 - 48	R
40647 (1 reg)	44518	Status of outputs 51 - 58, 61 - 68	R
40648 (1 reg)	44520	Level status 1 – 16	R
40649 (1 reg)	44522	Level status 17 – 32	R
40700 (1 reg)	44600	Clock: Year	R
40701 (1 reg)	44602	Clock: Month	R
40702 (1 reg)	44604	Clock: Day	R
40703 (1 reg)	44606	Clock: Hour	R
40704 (1 reg)	44608	Clock: Minute	R
42000 (1 reg)	46000	Command register	R/W *
42010 (3 reg)	46010	Level 1 value	R/W
42013 (3 reg)	46012	Level 2 value	R/W
42016 (3 reg)	46014	Level 3 value	R/W
42019 (3 reg)	46016	Level 4 value	R/W

Data type: Integer	Data type: float (2 reg./value)	Explanation	R/W
42022 (3 reg)	46018	Level 5 value	R/W
42025 (3 reg)	46020	Level 6 value	R/W
42028 (3 reg)	46022	Level 7 value	R/W
42031 (3 reg)	46024	Level 8 value	R/W
42034 (3 reg)	46026	Level 9 value	R/W
42037 (3 reg)	46028	Level 10 value	R/W
42040 (3 reg)	46030	Level 11 value	R/W
42043 (3 reg)	46032	Level 12 value	R/W
42046 (3 reg)	46034	Level 13 value	R/W
42049 (3 reg)	46036	Level 14 value	R/W
42052 (3 reg)	46038	Level 15 value	R/W
42055 (3 reg)	46040	Level 16 value	R/W
42058 (3 reg)	46042	Level 17 value	R/W
42061 (3 reg)	46044	Level 18 value	R/W
42064 (3 reg)	46046	Level 19 value	R/W
42067 (3 reg)	46048	Level 20 value	R/W
42070 (3 reg)	46050	Level 21 value	R/W
42073 (3 reg)	46052	Level 22 value	R/W
42076 (3 reg)	46054	Level 23 value	R/W
42079 (3 reg)	46056	Level 24 value	R/W
42082 (3 reg)	46058	Level 25 value	R/W
42085 (3 reg)	46060	Level 26 value	R/W
42088 (3 reg)	46062	Level 27 value	R/W
42091 (3 reg)	46064	Level 28 value	R/W
42094 (3 reg)	46066	Level 29 value	R/W
42097 (3 reg)	46068	Level 30 value	R/W
42100 (3 reg)	46070	Level 31 value	R/W
42103 (3 reg)	46072	Level 32 value	R/W

*/ The read value is always ‘zero’.

Important:

‘Sum’, ‘Difference’, ‘Output 1-8’ ‘Input A-D Force’ and ‘Input A-D Signal’ registers for a function block are only valid when corresponding ‘Error code’ register equals 0. Therefore it’s recommended to read the ‘Error code’ register together with these registers.

Instrument type

This register holds the type of the instrument. For a G6 Multi Channel Force Instrument this value is 6001.

Program number

This register holds the number of the program.

Program major and minor version

These registers holds the major and minor version for the program.

Serial number

This register holds the serial number of the instrument. The value 241000 means 24-1000. This can be used by the master to be sure that an instrument with a specific serial number is used for a special process.

Command error

This register holds the error code when a command has been sent to the instrument. A command that gives a 03 as exception will have an error code with a better description of the problem in this register. Normally this register should contain '00' which means no error. Error codes 0 to 255 are valid in this register.

Instrument state

This register contains the state of the G6 instrument unit.

Code	Description
00	**'Starting up' state.** The instrument is starting up after a reset or power on.
01	**'Wait for start' state.** The instrument is waiting for a start command to go in process.
03	**'Normal' state.** There are no parameter errors in the system. **Note:** Force/Web Tension value errors still indicates normal state.
04	**'Error' state.** An error has been detected during start up of the instrument.
05	**'Fatal error' state.** An error has been detected during start up of the instrument. It's not possible to enter any other state from here.

Instrument error

This register holds the overall error code for the instrument.
Normally this register should contain ‘00’ which means no error.

Instrument status

This register holds the overall status for the instrument.

Bits set to 1 in this register have the following meaning:

Bit no	Function	Comment
0	Remote operation	‘1’ = On ‘0’ = Off
1	Program reset	The bit is set each time the program starts, and it indicates that volatile data is lost. The bit is reset as Instrument status is read, over serial communication (Modbus RTU) or over Ethernet (Modbus TCP), for the first time after reset/power-up. Note that the reply contains the set bit if it was set. Reading Instrument Status via Fieldbus interface or EtherNet/IP will not reset this bit. To reset this bit with fieldbus interface a specific reset command must be used. Care must be taken if more than one interface is used to communicate with the instrument and the Program reset bit is to be used.
2-15	Not used	

Note: If this register (bits) is read as float value,
see description of Data representation.

Function Block X: Error code

This register holds the first error code for a Function Block.
Normally this register should contain ‘000’ which means no error.
Error codes 000 to 255 and 000 to X255 are valid in this register, where X (1-4) indicates which input channel (A-D) the three digit error code belongs to.

Function Block X: Status

Status for a Function Block.

Bits set to 1 in this register have the following meaning:

Bit no	Function	Comment
0	Input A faulty	There are an error on Input A. See ‘Block X: Error code’.
1	Input B faulty	There are an error on Input B. See ‘Block X: Error code’.
2	Input C faulty	There are an error on Input C. See ‘Block X: Error code’.
3	Input D faulty	There are an error on Input D. See ‘Block X: Error code’.
4-15	Not used	

Note: If this register (bits) is read as float value,
see description of Data representation.

Function Block X: Sum

This register holds the sum value for a Function Block. The actual use of the sum value varies with type of Function Block.

The value should **not** be read alone because the status and error codes are stored in other registers. The value is only valid when the register ‘Function Block X:Error code’ equals 00.

Function Block X: Difference

This register holds the difference value for a Function Block. The actual use of the difference value varies with type of Function Block.

The value should **not** be read alone because the status and error codes are stored in other registers. The value is only valid when the register ‘Function Block X:Error code’ equals 00.

Function Block X: Output 1

This register holds the Output 1 value for a Function Block. The actual use of the value varies with type of Function Block. If this output is not used 0 will be output.

The value should **not** be read alone because the status and error codes are stored in other registers. The value is only valid when the register ‘Function Block X:Error code’ equals 00.

Function Block X: Output 2 – Output 8

See ‘Function Block X: Output 1’.

Function Block X: Input A Force

This register holds the Input A Force value for a Function Block. If this input is not used 0 will be output.

The value should **not** be read alone because the status and error codes are stored in other registers. The value is only valid when the register ‘Function Block X:Error code’ equals 00.

Function Block X: Input B Force – Input D Force

See ‘Function Block X: Input A Force’.

Function Block X: Input A signal (mV/V)

This register holds the Input A signal in mV/V for a Function Block. This register could be used for fault finding in the system. If this input is not used 0 will be output.

The value should **not** be read alone because the status and error codes are stored in other registers. The value is only valid when the register ‘Function Block X:Error code’ equals 00.

Function Block X: Input B signal – Input D signal (mV/V)

See ‘Function Block X: Input A signal (mV/V)’.

Analog output value 1, 2, 3, 4

These registers holds the values sent to the analog outputs. The registers can be used for fault finding in the system.
Note: The value is rounded to 3 decimals.

Status of inputs 11-18, 21-28

Bits set to 1 in this register have the following meaning:

Bit no	Function	Bit no	Function
0	Digital input 11 activated.	**8**	Digital input 21 activated.
1	Digital input 12 activated.	**9**	Digital input 22 activated.
2	Digital input 13 activated.	**10**	Digital input 23 activated.
3	Digital input 14 activated.	**11**	Digital input 24 activated.
4	Digital input 15 activated.	**12**	Digital input 25 activated.
5	Digital input 16 activated.	**13**	Digital input 26 activated.
6	Digital input 17 activated.	**14**	Digital input 27 activated.
7	Digital input 18 activated.	**15**	Digital input 28 activated.

**Note: If this register (bits) is read as float value,
see description of Data representation.**

Status of inputs 31-38, 41-48

Bits set to 1 in this register have the following meaning:

Bit no	Function	Bit no	Function
0	Digital input 31 activated.	**8**	Digital input 41 activated.
1	Digital input 32 activated.	**9**	Digital input 42 activated.
2	Digital input 33 activated.	**10**	Digital input 43 activated.
3	Digital input 34 activated.	**11**	Digital input 44 activated.
4	Digital input 35 activated.	**12**	Digital input 45 activated.
5	Digital input 36 activated.	**13**	Digital input 46 activated.
6	Digital input 37 activated.	**14**	Digital input 47 activated.
7	Digital input 38 activated.	**15**	Digital input 48 activated.

Note: If this register (bits) is read as float value, see description of Data representation.

Status of inputs 51-58, 61-68

Bits set to 1 in this register have the following meaning:

Bit no	Function	Bit no	Function
0	Digital input 51 activated.	**8**	Digital input 61 activated.
1	Digital input 52 activated.	**9**	Digital input 62 activated.
2	Digital input 53 activated.	**10**	Digital input 63 activated.
3	Digital input 54 activated.	**11**	Digital input 64 activated.
4	Digital input 55 activated.	**12**	Digital input 65 activated.
5	Digital input 56 activated.	**13**	Digital input 66 activated.
6	Digital input 57 activated.	**14**	Digital input 67 activated.
7	Digital input 58 activated.	**15**	Digital input 68 activated.

Note: If this register (bits) is read as float value, see description of Data representation.

Status of outputs 11-18, 21-28

Bits set to 1 in this register have the following meaning:

Bit no	Function	Bit no	Function
0	Digital output 11 activated.	**8**	Digital output 21 activated.
1	Digital output 12 activated.	**9**	Digital output 22 activated.
2	Digital output 13 activated.	**10**	Digital output 23 activated.
3	Digital output 14 activated.	**11**	Digital output 24 activated.
4	Digital output 15 activated.	**12**	Digital output 25 activated.
5	Digital output 16 activated.	**13**	Digital output 26 activated.
6	Digital output 17 activated.	**14**	Digital output 27 activated.
7	Digital output 18 activated.	**15**	Digital output 28 activated

Note: If this register (bits) is read as float value,
see description of Data representation.

Status of outputs 31-38, 41-48

Bits set to 1 in this register have the following meaning:

Bit no	Function	Bit no	Function
0	Digital output 31 activated.	**8**	Digital output 41 activated.
1	Digital output 32 activated.	**9**	Digital output 42 activated.
2	Digital output 33 activated.	**10**	Digital output 43 activated.
3	Digital output 34 activated.	**11**	Digital output 44 activated.
4	Digital output 35 activated.	**12**	Digital output 45 activated.
5	Digital output 36 activated.	**13**	Digital output 46 activated.
6	Digital output 37 activated.	**14**	Digital output 47 activated.
7	Digital output 38 activated.	**15**	Digital output 48 activated

Note: If this register (bits) is read as float value,
see description of Data representation.

Status of outputs 51-58, 61-68

Bits set to 1 in this register have the following meaning:

Bit no	Function	Bit no	Function
0	Digital output 51 activated.	**8**	Digital output 61 activated.
1	Digital output 52 activated.	**9**	Digital output 62 activated.
2	Digital output 53 activated.	**10**	Digital output 63 activated.
3	Digital output 54 activated.	**11**	Digital output 64 activated.
4	Digital output 55 activated.	**12**	Digital output 65 activated.
5	Digital output 56 activated.	**13**	Digital output 66 activated.
6	Digital output 57 activated.	**14**	Digital output 67 activated.
7	Digital output 58 activated.	**15**	Digital output 68 activated

Note: If this register (bits) is read as float value,
see description of Data representation.

Level status 1-16

Bits set to 1 in this register have the following meaning:

Bit no	Function	Comment
0	Above level 1	The supervised signal is above Level 1.
1	Above level 2	The supervised signal is above Level 2.
2	Above level 3	The supervised signal is above Level 3.
3	Above level 4	The supervised signal is above Level 4.
4	Above level 5	The supervised signal is above Level 5.
5	Above level 6	The supervised signal is above Level 6.
6	Above level 7	The supervised signal is above Level 7.
7	Above level 8	The supervised signal is above Level 8.
8	Above level 9	The supervised signal is above Level 9.
9	Above level 10	The supervised signal is above Level 10.
10	Above level 11	The supervised signal is above Level 11.
11	Above level 12	The supervised signal is above Level 12.
12	Above level 13	The supervised signal is above Level 13.
13	Above level 14	The supervised signal is above Level 14.
14	Above level 15	The supervised signal is above Level 15.
15	Above level 16	The supervised signal is above Level 16.

Note: If this register (bits) is read as float value,
see description of Data representation.

Level status 17-32

Bits set to 1 in this register have the following meaning:

Bit no	Function	Comment
0	Above level 17	The supervised signal is above Level 17.
1	Above level 18	The supervised signal is above Level 18.
2	Above level 19	The supervised signal is above Level 19.
3	Above level 20	The supervised signal is above Level 20.
4	Above level 21	The supervised signal is above Level 21.
5	Above level 22	The supervised signal is above Level 22.
6	Above level 23	The supervised signal is above Level 23.
7	Above level 24	The supervised signal is above Level 24.
8	Above level 25	The supervised signal is above Level 25.
9	Above level 26	The supervised signal is above Level 26.
10	Above level 27	The supervised signal is above Level 27.
11	Above level 28	The supervised signal is above Level 28.
12	Above level 29	The supervised signal is above Level 29.
13	Above level 30	The supervised signal is above Level 30.
14	Above level 31	The supervised signal is above Level 31.
15	Above level 32	The supervised signal is above Level 32.

Note: If this register (bits) is read as float value,
see description of Data representation.

Clock

These registers are used to read the time and date from the instrument.

Command register

As this register is read, the answer will always contain only zero's.

There are a number of actions that can be activated in the instrument. The value of this register (when different from zero) will activate one of these actions, as described in below.

When an action cannot be performed for some reason (wrong state etc.) an exception is given as reply. When an exception with code 03 is received the command error register could be read to get a better error explanation.

Cmd	Action activated in instrument	Description
0	No action	
1	Start operation	When the instrument is in 'Wait for start state', this command can be used to start up the instrument.
2	Enter Remote operation	This command disables the keys on the instrument. This means that an external computer is controlling the instrument or the instrument is controlled using digital inputs.
3	Exit Remote operation	This command enables the keys and leaves the remote operation.
10	Function Block 1: Set zero	Used to set all Function Block 1 inputs to zero.
20	Function Block 2: Set zero	Used to set all Function Block 2 inputs to zero.
30	Function Block 3: Set zero	Used to set all Function Block 3 inputs to zero.
40	Function Block 4: Set zero	Used to set all Function Block 4 inputs to zero.
50	Function Block 5: Set zero	Used to set all Function Block 5 inputs to zero.
60	Function Block 6: Set zero	Used to set all Function Block 6 inputs to zero.
70	Function Block 7: Set zero	Used to set all Function Block 7 inputs to zero.
80	Function Block 8: Set zero	Used to set all Function Block 8 inputs to zero.

Level X value

These registers are used to read and write levels that are supervised by the instrument.

I/O bits (Coils)

The instrument has a number of I/O bits that the master can write to using Modbus function 05 or 15.

Each of these I/O bits are linked to a command in the instrument, which is described previously in this manual.

Set the I/O bit with the same number as the command that should be executed.

The action is activated if the master sets the I/O bit to 'ON'.

If the master sets the I/O bit to 'OFF', this is accepted, but no action is activated.

All I/O bits are WRITE ONLY. This means the master cannot read the I/O bits but only write to them.

Note: If the master tries to write to more than one I/O bit (Modbus function 15) the instrument will act on the lowest I/O bit number only.

Data representation

Data sent to and from the instrument uses 16 bit holding registers (40XXX) and can use different formats for flexibility.

Integer

Unsigned integer (1 modbus register)

Values stored in one modbus register as an unsigned integer (16 bit number without decimals).

Scaled integer (2 modbus registers + 1 modbus register = 3 modbus registers)

Values stored in a special 3 register format. The first two registers are used as a 32 bit long integer value (with sign) and the third register is holding the number of decimals in the value.

Example: 12345678 (32 bit number) in the two first registers and 3 in the third register gives the value: 12345.678.

Register	Hex	Decimal	Description
1	00BC	188	The 16 most significant bits in the value.
2	614E	24910	The 16 least significant bits in the value.
3	0003	3	The number of decimals.

Calculations in decimal numbers:

First multiply the most significant register with 2^{16} (65536) and add the least significant register to the value.

$188 * 2^{16} + 24910 = 12345678$

Now divide the number to get the right number of decimals. The decimal register was set to 3 in this example, which gives the value $10^3 = 1000$ to divide with.

12345678 / 1000 = 12345.678

Float values

The type of float values used in the communication is selected in the set-up for the different communication interfaces.
Values stored as standard IEEE 32 bit float values. Each value has two registers assigned to it. To read/write a float value an even number of Modbus registers, starting at an even address, must be read/written each time. The float values are stored in two different register orders.

Some devices may transfer the values with the high order bits in the first register and the low order bits in the second register. Other devices may invert the register order.

Modicon float: For true Modicon PLC's.

Float: Many third party controllers that support Modicon protocol use the float format where all bytes are written out in order to one 32 bit register, as opposed to Modicon float which uses 2 consecutive 16 bit registers.

When float registers representing bits are read, the bits set are returned as a float value.

For example if bit 4 is set the value 16.0 is returned as a float value, and if both bit 0 and bit 4 are set the value 17.0 is returned as a float value.
To use the value it's a good choice to convert it to an unsigned integer where the bits can be compared.

Exception responses

When the master sends a query to a slave it expects a normal response (as described earlier). One of the following three events occur after a query from the master.

1. Normal response.
The slave has received the query without communication error and can handle the query normally. The slave returns a normal response.

2. Communication error.
If the slave does not receive the query due to a communication error, or detects some communication error (parity error or checksum error), **no** response is returned. The master should process a time-out for the query.

3. Command error.
If the slave receives the query without any communication error, but cannot handle the query, e.g. if the command was not valid, the requested register number not valid or instrument in a mode where the command was not allowed, then the slave will return an exception response informing the master of the nature of the error.

The following exception codes are possible.

Code	Name	Description
01	Illegal function	Not a valid function code. Valid function codes are 01, 02, 03, 05, 06, 08, 15, 16.
02	Illegal data address	Not a valid data address. See ‘Register description’ for a list of allowed registers.
03	Illegal data value	Value in data query field not valid. This code is also used if the instrument has received the query but cannot perform it. To get a better explanation of the error, the ‘command error’ register could be read.

Supported Modbus functions

Function	Description
01 Read Coil Status	Reads the state of discrete outputs (0X references, coils). Only implemented because some 'masters' use this function to initiate communication. Coil range: 1 – 16 (Max number of points to read: 16). Response: Zero (OFF) for all requested points.
02 Read Input Status	Reads the state of discrete inputs (1X references). This function is implemented only because some 'masters' use this function to initiate communication. Input range: 1 – 16 (Max number of points to read: 16). Response: Zero (OFF) for all requested points.
03 Read Holding Reg.	Reads the binary contents of holding registers (4X references). Max number of registers to read: 125
05 Force Single Coil	Forces a single coil (0X references) to either ON or OFF. This function is used to activate commands in the instrument.
06 Preset Single Reg.	Presets a value into a single holding register (4X references).
08 Diagnostics	This function can provide a series of different communication tests, depending on a sub function code. The instrument supports only sub function code 00, which is a 'loop-back' test. The same data as received will be sent back to the master. The diagnostics function will always return 6 bytes of data regardless of how many are sent.
15 Force Multiple Coils	Forces each coil (0X references) in a sequence of coils to either ON or OFF. This function is used to activate commands in the instrument. Max. number of points: 16 (only the first is used).
16 Preset Multiple reg.	Presets values into a sequence of holding registers (4X references). Max number of registers to preset: 125

Note: No broadcast messages are allowed.

It is possible to send or fetch any number of registers (max 125) or I/O bits (max. 16). If the master tries to read more registers than there are available, the instrument will send dummy values for those registers not available.

Fieldbus interface

The optional fieldbus interface is based on a network communication module from HMS Industrial Networks. Available fieldbusses are PROFIBUS, DeviceNet and PROFINET. With setup parameters the fieldbus interface is configured for the specific needs of an installation. It is possible in some cases to setup address, baud rate (depending on the actual fieldbus type) and mapping of the memory area in the fieldbus module that is available to the network.

The mapping is divided in one base block for data from the master to the instrument, one base block for data to the master from the instrument and 0 – 12 (selected with a setup parameter) configurable data blocks. The base blocks are mandatory. The data blocks are configurable regarding the content and in some cases also format (floating-point or integer).

The registers mentioned below are Modbus registers as defined in section Communication – Modbus Protocol. Each Modbus register is two bytes wide. This section also describes commands.

The size of the base blocks is 16 bytes from master to instrument and 32 bytes from the instrument to the master. The base blocks contain Instrument Error and Instrument Status. Besides instrument error and status information are the base blocks used for general purpose reading and writing of data and also for issuing commands to the instrument.

The mapping in the master and the instrument must always correspond.

Setup of fieldbus communication

- Complete the set-up of fieldbus communication before connecting it to the network to avoid possible network failure due to mismatch in configuration between network and instrument.
- Select the fieldbus type used in the ‘Hardware Configuration’ menu.
  Note that the instrument will be restarted after changes in the hardware setup.
- Select the appropriate device address for the instrument (this is not valid for PROFINET-module). Address is setup in menu ‘Communication – Fieldbus’. Note that the address range is depending on type of fieldbus.
- Select baudrate (this is not valid for PROFINET-module), if applicable, according to the used baudrate in the network. Some fieldbusses may support automatic baud rate setting. Use fixed baudrate setting if there are difficulties to connect to the network or if the network baudrate is known.
- Select the number of data blocks that is needed for the installation. It is possible to use only the “base block” mapping if there is room for all necessary data within the 12 consecutive modbus registers that are defined within the base block (data from the instrument). The starting address of the read area is settable.
- Configure the desired number of data blocks. Note that the data blocks may still be configured as ‘Not In Use’ in which case the data within the block will be undefined.
- Check that the configuration of the master is compatible with the actual configuration of the instrument.
- Connect to the network.

Additional information for PROFINET

There are two ways to communicate with G6 via PROFINET, Cyclic Process data and/or Acyclic data. It is recommended to only use one of them.

Cyclic Process Data
The G6 instrument will be automatically set up with following Cyclic Process data:

- Slot 0 = Device Access Point.
- Slot 1 = Output data, ‘modul_out_1’ (Fixed)
    - Type = Byte array according to Chapter ‘Data from the network (Outputs in the master)’
    - No of bytes = 16 (fixed)
- Slot 2 = Input data, ‘modul_in_0’ to ‘modul_in_12’
    - Type = byte array according to Chapter ‘Data to the network (Inputs in the master)’
    - No of bytes = 32 to 224 depending on number of optional data blocks. If no data blocks are setup in the instrument, ‘modul_in_0’ shall be used. If 1 data block is setup, ‘modul_in_1’ and so on.

Each data in the byte array shall be converted to suitable data type in the PLC, according to Chapter ‘Fieldbus Data Definitions’.

If a command is written at the command bytes a command acknowledgement is set in the cyclic Input data.

Note:

Data type can be selected as Integer or Floating Point in the G6 instrument.

Acyclic data

G6 has following slots for acyclic communication:

- Slot 0 = Device Access Point.
- Slot 1 = Output data, ‘modul_out_1’ (Fixed)
    - Type = Byte array according to Chapter ‘Data from the network (Outputs in the master)’
    - No of bytes = 16 (fixed)
- Slot 2 = Input data, ‘modul_in_0’ to ‘modul_in_12’
    - Type = byte array according to Chapter ‘Data to the network (Inputs in the master)’
    - No of bytes = 32 to 224 depending on number of optional data blocks. If no data blocks are setup in the instrument, ‘modul_in_0’ shall be used. If 1 data block is setup, ‘modul_in_1’ and so on.

Each data in the byte array shall be converted to suitable data type in the PLC, according to Chapter ‘Fieldbus Data Definitions’.

Note:

Data type can be selected as Integer or Floating Point in the G6 instrument.

Notes for slot 1

Slot 1 is Output data according to chapter ‘Data from the network (Outputs in the master)’ and supports read and write.

Data length has to be 16 bytes at read and write.

If a command is written at the command bytes a command acknowledgement is set in the acyclic Input data (slot 2).

If data size is not equal to 16 bytes when writing to slot 1 the command will be invalid, but the received data will be saved at acyclic Output data anyway.

Notes for slot 2

Slot 2 is Input data according to chapter ‘Data to the network (Inputs in the master)’ and support only read.

Data length has to be 32-224 bytes at read, this is dependent on the setup of data blocks. If one data blocks is used, 32 + 16 bytes shall be read.

Conformance Class

Conformance Class C (IRT)

Ethernet Interface

100 Mbit full duplex

IP settings / Network Configuration

IP settings / Network configuration are set by the IO Controller. Discovery and Configuration Protocol (DCP) is used to identify/configure PROFINET Devices. IP settings are:

- IP address
- Subnet mask
- Gateway address
- DHCP (not supported)
- Station name

IP address for the PROFINET Fieldbus adaptor can be seen in G6 instrument:

Main Menu->Maintenance->Diagnostics->Fieldbus

PROFINET IO Object Information

Vendor ID: 03FF (Hex)

Device ID: 0003 (Hex)

Recommended software to scan PROFINET network

- Siemens Proneta (free software)
- HMS Ipconfig (free software)

Following PROFINET functions are not supported

- Fast startup
- PROFIenergy Profile
- PROFIsafe
- Remap
- SMTP

PROFINET General

- The PROFINET Fieldbus adaptor supports Media Redundancy Protocol (MRP).
- It is possible to use a Web browser to configure the network settings of the Fieldbus adaptor and see status and acyclic data. The IP address for the PROFINET Fieldbus adaptor shall be used.

Fieldbus data definitions

Data from the network (Outputs in the master)

General

This 16 bytes block is mandatory, i.e. it is always mapped to the fieldbus in the instrument.

Byte	Contents
00	Command
01	Number of registers to write
02	Start address, Read/Write MSB
03	Start address, Read/Write
04	Write register 1 MSB
05	Write register 1
06	Write register 2 MSB
07	Write register 2
08	Write register 3 MSB
09	Write register 3
10	Write register 4 MSB
11	Write register 4
12	Write register 5 MSB
13	Write register 5
14	Write register 6 MSB
15	Write register 6

Byte 0:

The command byte is used when setting the read window starting address, writing data to the instrument and to issue various commands.

Commands:

0	No action
250 (hex FA)	Change read window
251 (hex FB)	Write data
252 (hex FC)	Clear the Program reset bit in the Instrument Status register.

Plus commands according to the manual, chapter ‘Communication – Modbus protocol – Command register’.

Note that a new command is detected when the content of the command register is changed. If the same command is used more than once another command e.g. 0 must be used in between.

The response to a given command is the ‘Command acknowledge’ and the ‘Command error’ bytes that are described below in section ‘Data to the network’.

Byte 1:

Used to define the number of registers to write.

Bytes 2 and 3:

Define from which register number to read or write.

Bytes 4 to 15:

Contains the data when writing to the instrument.

Data to the network (Inputs in the master)

General

Data to the fieldbus are divided into two categories, one is the mandatory “base block” which contain general data and the 12 modbus register used for reading from the instrument. The second part is the up to twelve configurable data blocks.

Byte	Contents
00	Instrument error MSB
01	Instrument error
02	Instrument Status MSB
03	Instrument Status
04	Command acknowledge
05	Command error
06	Start address, Read MSB
07	Start address, Read
08	Read register 1 MSB
09	Read register 1
10	Read register 2 MSB
11	Read register 2
12	Read register 3 MSB
13	Read register 3
14	Read register 4 MSB
15	Read register 4

Byte	Contents
16	Read register 5 MSB
17	Read register 5
18	Read register 6 MSB
19	Read register 6
20	Read register 7 MSB
21	Read register 7
22	Read register 8 MSB
23	Read register 8
24	Read register 9 MSB
25	Read register 9
26	Read register 10 MSB
27	Read register 10
28	Read register 11 MSB
29	Read register 11
30	Read register 12 MSB
31	Read register 12

The first 32 bytes of data from the instrument to the fieldbus are mandatory.

Bytes 0 and 1:

Contains the actual instrument error information (the value 0 means no error). See chapter ‘Communication – Modbus protocol – Instrument error’.

Bytes 2 and 3:

The actual status information for the instrument, see chapter ‘Communication – Modbus protocol – Instrument status’.

Byte 4:

The ‘Command acknowledge’. It will be equal to the command number if the command was successfully executed. If the command failed byte 4 will have the value 240 (hex F0).

Byte 5:

The possible ‘Command error’ code. The error code is explained in chapter ‘Troubleshooting – Error codes’. This byte will be zero if a command is correctly executed.

Bytes 6 and 7:

These two bytes is the starting address of the reading area following in bytes 8 to 31. The address defines the first of the 12 consecutive modbus registers in the read area. See chapter ‘Communication – Modbus protocol’ for details on modbus register address definitions.

Bytes 8 to 31:

These 24 bytes is the area used when the user wants to read any data that is accessible through modbus registers. The address (number) of the first register is defined in bytes 6 and 7 and the instrument will keep the 24 bytes (12 registers) updated.

Configurable data blocks

Byte	Contents
32	Start of data block 1
48	Start of data block 2
64	Start of data block 3
80	Start of data block 4
96	Start of data block 5
112	Start of data block 6
128	Start of data block 7
144	Start of data block 8
160	Start of data block 9
176	Start of data block 10
192	Start of data block 11
208	Start of data block 12

Data Blocks is used to transfer data from the instrument to the master. Up to 12 data blocks can be used. Each block consists of 16 bytes. The data blocks have fixed positions in memory, see list below.

Last byte is no. 223. A total of 224 bytes data can be mapped from the instrument to the master. Of the maximum 224 bytes are 32 bytes the mandatory base block.

Type of data blocks

- Function Block sum and difference values, floating point or integer format
- Function Block Output 1 and 2 values, floating point or integer format
- Function Block Output 3 and 4 values, floating point or integer format
- Function Block Output 5 and 6 values, floating point or integer format
- Function Block Output 7 and 8 values, floating point or integer format
- Input A and B forces, floating point or integer format
- Input C and D forces, floating point or integer format
- Input A and B signals (transducer mV/V), floating point or integer format
- Input C and D signals (transducer mV/V), floating point or integer format
- Level status, floating point or integer format
- Input status, floating point format
- Output status, floating point format
- Input and output status, integer format
- Analog output value 1 to 4, floating point format
- Analog output value 1 and 2, integer format
- Analog output value 3 and 4, integer format

The offset in the left column, in the following descriptions of the data block types, is the starting byte number (see table above) for the actual data block number.

See chapter ‘Communication – Modbus protocol’ for a description of the contents of the different data blocks and the integer and floating-point data formats.

Function Block sum and difference values data block

Byte	Contents (Floating-point format)	Contents (Integer format)
Offset + 0	Function Block x: Error code MSB	Function Block x: Error code MSB
Offset + 1	Function Block x: Error code	Function Block x: Error code
Offset + 2	Function Block x: Error code	Function Block x: Status MSB
Offset + 3	Function Block x: Error code	Function Block x: Status
Offset + 4	Function Block x: Status MSB	Function Block x: Sum, int MSB
Offset + 5	Function Block x: Status	Function Block x: Sum, int
Offset + 6	Function Block x: Status	Function Block x: Sum, int
Offset + 7	Function Block x: Status	Function Block x: Sum, int
Offset + 8	Function Block x: Sum MSB	Function Block x: Sum, dec MSB
Offset + 9	Function Block x: Sum	Function Block x: Sum, dec
Offset + 10	Function Block x: Sum	Function Block x: Difference, int MSB
Offset + 11	Function Block x: Sum	Function Block x: Difference, int
Offset + 12	Function Block x: Difference MSB	Function Block x: Difference, int
Offset + 13	Function Block x: Difference	Function Block x: Difference, int
Offset + 14	Function Block x: Difference	Function Block x: Difference, dec MSB
Offset + 15	Function Block x: Difference	Function Block x: Difference, dec

X is the selected (by parameter) Function Block number for the data block.

Function Block Output 1 and Output 2 values data block

Byte	Contents (Floating-point format)	Contents (Integer format)
Offset + 0	Function Block x: Error code MSB	Function Block x: Error code MSB
Offset + 1	Function Block x: Error code	Function Block x: Error code
Offset + 2	Function Block x: Error code	Function Block x: Status MSB
Offset + 3	Function Block x: Error code	Function Block x: Status
Offset + 4	Function Block x: Status MSB	Function Block x: Output 1, int MSB
Offset + 5	Function Block x: Status	Function Block x: Output 1, int
Offset + 6	Function Block x: Status	Function Block x: Output 1, int
Offset + 7	Function Block x: Status	Function Block x: Output 1, int
Offset + 8	Function Block x: Output 1 MSB	Function Block x: Output 1, dec MSB
Offset + 9	Function Block x: Output 1	Function Block x: Output 1, dec
Offset + 10	Function Block x: Output 1	Function Block x: Output 2, int MSB
Offset + 11	Function Block x: Output 1	Function Block x: Output 2, int
Offset + 12	Function Block x: Output 2 MSB	Function Block x: Output 2, int
Offset + 13	Function Block x: Output 2	Function Block x: Output 2, int
Offset + 14	Function Block x: Output 2	Function Block x: Output 2, dec MSB
Offset + 15	Function Block x: Output 2	Function Block x: Output 2, dec

X is the selected (by parameter) Function Block number for the data block.

Function Block Output 3 and Output 4 values data block

Function Block Output 5 and Output 6 values data block

Function Block Output 7 and Output 8 values data block

See ‘Function Block Output 1 and Output 2 values data block’ above.

Function Block Input A Force and Input B Force values data block

Byte	Contents (Floating-point format)	Contents (Integer format)
Offset + 0	Function Block x: Error code MSB	Function Block x: Error code MSB
Offset + 1	Function Block x: Error code	Function Block x: Error code
Offset + 2	Function Block x: Error code	Function Block x: Status MSB
Offset + 3	Function Block x: Error code	Function Block x: Status
Offset + 4	Function Block x: Status MSB	Function Block x: Input A Force, int MSB
Offset + 5	Function Block x: Status	Function Block x: Input A Force, int
Offset + 6	Function Block x: Status	Function Block x: Input A Force, int
Offset + 7	Function Block x: Status	Function Block x: Input A Force, int
Offset + 8	Function Block x: Input A Force MSB	Function Block x: Input A Force, dec MSB
Offset + 9	Function Block x: Input A Force	Function Block x: Input A Force, dec
Offset + 10	Function Block x: Input A Force	Function Block x: Input B Force, int MSB
Offset + 11	Function Block x: Input A Force	Function Block x: Input B Force, int
Offset + 12	Function Block x: Input B Force MSB	Function Block x: Input B Force, int
Offset + 13	Function Block x: Input B Force	Function Block x: Input B Force, int
Offset + 14	Function Block x: Input B Force	Function Block x: Input B Force, dec MSB
Offset + 15	Function Block x: Input B Force	Function Block x: Input B Force, dec

X is the selected (by parameter) Function Block number for the data block.

Function Block Input C Force and Input D Force values data block

See ‘Function Block Input A Force and Input B Force values data block’ above.

Function Block Input A Signal and Input B Signal values data block

Byte	Contents (Floating-point format)	Contents (Integer format)
Offset + 0	Function Block x: Error code MSB	Function Block x: Error code MSB
Offset + 1	Function Block x: Error code	Function Block x: Error code
Offset + 2	Function Block x: Error code	Function Block x: Status MSB
Offset + 3	Function Block x: Error code	Function Block x: Status
Offset + 4	Function Block x: Status MSB	Function Block x: Input A Signal, int MSB
Offset + 5	Function Block x: Status	Function Block x: Input A Signal, int
Offset + 6	Function Block x: Status	Function Block x: Input A Signal, int
Offset + 7	Function Block x: Status	Function Block x: Input A Signal, int
Offset + 8	Function Block x: Input A Signal MSB	Function Block x: Input A Signal, dec MSB
Offset + 9	Function Block x: Input A Signal	Function Block x: Input A Signal, dec
Offset + 10	Function Block x: Input A Signal	Function Block x: Input B Signal, int MSB
Offset + 11	Function Block x: Input A Signal	Function Block x: Input B Signal, int
Offset + 12	Function Block x: Input B Signal MSB	Function Block x: Input B Signal, int
Offset + 13	Function Block x: Input B Signal	Function Block x: Input B Signal, int
Offset + 14	Function Block x: Input B Signal	Function Block x: Input B Signal, dec MSB
Offset + 15	Function Block x: Input B Signal	Function Block x: Input B Signal, dec

X is the selected (by parameter) Function Block number for the data block.

Function Block Input C Signal and Input D Signal values data block

See ‘Function Block Input A Signal and Input B Signal values data block’ above.

Level status

Byte	Contents (Floating-point format)	Contents (Integer format)
Offset + 0	Level status 1 – 16 MSB	Level status 1 – 16 MSB
Offset + 1	Level status 1 – 16	Level status 1 – 16
Offset + 2	Level status 1 – 16	Level status 17 – 32 MSB
Offset + 3	Level status 1 – 16	Level status 17 – 32
Offset + 4	Level status 17 – 32 MSB	Not used
Offset + 5	Level status 17 – 32	Not used
Offset + 6	Level status 17 – 32	Not used
Offset + 7	Level status 17 – 32	Not used
Offset + 8	Not used	Not used
Offset + 9	Not used	Not used
Offset + 10	Not used	Not used
Offset + 11	Not used	Not used
Offset + 12	Not used	Not used
Offset + 13	Not used	Not used
Offset + 14	Not used	Not used
Offset + 15	Not used	Not used

Input Status (Floating-point format)

Byte	Content
Offset + 0	Status of inputs 11 – 18, 21 – 28 MSB
Offset + 1	Status of inputs 11 – 18, 21 – 28
Offset + 2	Status of inputs 11 – 18, 21 – 28
Offset + 3	Status of inputs 11 – 18, 21 – 28
Offset + 4	Status of inputs 31 – 38, 41 – 48 MSB
Offset + 5	Status of inputs 31 – 38, 41 – 48
Offset + 6	Status of inputs 31 – 38, 41 – 48
Offset + 7	Status of inputs 31 – 38, 41 – 48
Offset + 8	Status of inputs 51 – 58, 61 – 68 MSB
Offset + 9	Status of inputs 51 – 58, 61 – 68
Offset + 10	Status of inputs 51 – 58, 61 – 68
Offset + 11	Status of inputs 51 – 58, 61 – 68
Offset + 12	Not used
Offset + 13	Not used
Offset + 14	Not used
Offset + 15	Not used

Output Status (Floating-point format)

Byte	Content
Offset + 0	Status of outputs 11 – 18, 21 – 28 MSB
Offset + 1	Status of outputs 11 – 18, 21 – 28
Offset + 2	Status of outputs 11 – 18, 21 – 28
Offset + 3	Status of outputs 11 – 18, 21 – 28
Offset + 4	Status of outputs 31 – 38, 41 – 48 MSB
Offset + 5	Status of outputs 31 – 38, 41 – 48
Offset + 6	Status of outputs 31 – 38, 41 – 48
Offset + 7	Status of outputs 31 – 38, 41 – 48
Offset + 8	Status of outputs 51 – 58, 61 – 68 MSB
Offset + 9	Status of outputs 51 – 58, 61 – 68
Offset + 10	Status of outputs 51 – 58, 61 – 68
Offset + 11	Status of outputs 51 – 58, 61 – 68
Offset + 12	Not used
Offset + 13	Not used
Offset + 14	Not used
Offset + 15	Not used

Input/Output Status (Integer format)

Byte	Content
Offset + 0	Status of inputs 11 – 18, 21 – 28 MSB
Offset + 1	Status of inputs 11 – 18, 21 – 28
Offset + 2	Status of inputs 31 – 38, 41 – 48 MSB
Offset + 3	Status of inputs 31 – 38, 41 – 48
Offset + 4	Status of inputs 51 – 58, 61 – 68 MSB
Offset + 5	Status of inputs 51 – 58, 61 – 68
Offset + 6	Not used
Offset + 7	Not used
Offset + 8	Status of outputs 11 – 18, 21 – 28 MSB
Offset + 9	Status of outputs 11 – 18, 21 – 28
Offset + 10	Status of outputs 31 – 38, 41 – 48 MSB
Offset + 11	Status of outputs 31 – 38, 41 – 48
Offset + 12	Status of outputs 51 – 58, 61 – 68 MSB
Offset + 13	Status of outputs 51 – 58, 61 – 68
Offset + 14	Not used
Offset + 15	Not used

AOUT1-4 Value (Floating-point format)

Byte	Content
Offset + 0	Analogue output value 1 MSB
Offset + 1	Analogue output value 1
Offset + 2	Analogue output value 1
Offset + 3	Analogue output value 1
Offset + 4	Analogue output value 2 MSB
Offset + 5	Analogue output value 2
Offset + 6	Analogue output value 2
Offset + 7	Analogue output value 2
Offset + 8	Analogue output value 3 MSB
Offset + 9	Analogue output value 3
Offset + 10	Analogue output value 3
Offset + 11	Analogue output value 3
Offset + 12	Analogue output value 4 MSB
Offset + 13	Analogue output value 4
Offset + 14	Analogue output value 4
Offset + 15	Analogue output value 4

AOUT1-2 Value (Integer format)

Byte	Content
Offset + 0	Analogue output value 1, int MSB
Offset + 1	Analogue output value 1, int
Offset + 2	Analogue output value 1, int
Offset + 3	Analogue output value 1, int
Offset + 4	Analogue output value 1, dec MSB
Offset + 5	Analogue output value 1, dec
Offset + 6	Not used
Offset + 7	Not used
Offset + 8	Analogue output value 2, int MSB
Offset + 9	Analogue output value 2, int
Offset + 10	Analogue output value 2, int
Offset + 11	Analogue output value 2, int
Offset + 12	Analogue output value 2, dec MSB
Offset + 13	Analogue output value 2, dec
Offset + 14	Not used
Offset + 15	Not used

AOUT3-4 Value (Integer format)

Byte	Content
Offset + 0	Analogue output value 3, int MSB
Offset + 1	Analogue output value 3, int
Offset + 2	Analogue output value 3, int
Offset + 3	Analogue output value 3, int
Offset + 4	Analogue output value 3, dec MSB
Offset + 5	Analogue output value 3, dec
Offset + 6	Not used
Offset + 7	Not used
Offset + 8	Analogue output value 4, int MSB
Offset + 9	Analogue output value 4, int
Offset + 10	Analogue output value 4, int
Offset + 11	Analogue output value 4, int
Offset + 12	Analogue output value 4, dec MSB
Offset + 13	Analogue output value 4, dec
Offset + 14	Not used
Offset + 15	Not used

Examples

Example 1: Setting ‘Level 1 Value’ to 123.5 (Writing to float value register).

1. Make sure that the previous command was not 251. Set command byte (00) to 0 if previous command was 251.
2. Set number of registers (2) to write in byte 01.
3. Set start address (46010) in bytes 02 and 03.
   See chapter ‘Communication – Modbus protocol – General registers’.
4. Set the following four bytes (04 – 07) to the value to write (123.5).
5. Enter the command (251) in byte 00.

Byte	Description	Dec	Hex
00	Command	251	FB
01	Number of registers to write	2	02
02 – 03	Start address	46010	B3 BA
04 – 07	Value to write in register 1 and 2	123.5	42 F7 00 00
08 – 15	Write registers 3 – 6.	—	—

Example 2: Setting ‘Level 14 value’ to 123.5 (Writing to integer value register).

1. Make sure that the previous command was not 251. Set command byte (00) to 0 if previous command was 251.
2. Set number of registers (3) to write in byte 01.
3. Set start address (42049) in bytes 02 and 03.
   See chapter ‘Communication – Modbus protocol – General registers’.
4. Set the following four bytes (04 – 07) to the value to write (123.50) i.e. 12350 and two decimals.
5. Set bytes 08 and 09 to number of decimals. In this example is 2 decimals used.
6. Enter the command (251) in byte 00.

Byte	Description	Dec	Hex
00	Command	251	FB
01	Number of registers to write	3	03
02 – 03	Start address	42049	A4 41
04 – 07	Value to write in register 1 and 2	12350	00 00 30 3E
08 – 09	Value to write to register 3	2	00 02
10 – 15	Write registers 4 – 6.	—	—

Example 3: Set read window to read floating point data from Function Block 2 (registers 44050 to 44061). Note that the number of registers read is always 12.

1. Make sure that the previous command was not 250. Set command byte (00) to 0 if previous command was 250.
2. Set start address (44050) in bytes 02 and 03.
   See chapter 'Communication – Modbus protocol – General registers'.
3. Enter the command (250) in byte 00.

Byte	**Description**	**Dec**	**Hex**
00	Command	250	FA
01	Number of registers to write	—	—
02 – 03	Start address	44050	AC 12
04 – 15	Write registers 1 – 6.	—	—

Example 4: Reset the 'Program reset' bit in 'Instrument status'.

1. Make sure that the previous command was not 252.
2. Enter the command (252) in byte 00.

Byte	**Description**	**Dec**	**Hex**
00	Command	252	FC
01	Number of registers to write	—	—
02 – 03	Start address	—	—
04 – 15	Write registers 1 – 6.	—	—

Example 5: Other commands like Start operation, Zeroing etc. See chapter 'Communication – Modbus protocol – Command register' for a list of available commands.

1. Make sure that the previous command was not the desired command.
2. Enter the desired command in byte 00.

Byte	**Description**	**Dec**	**Hex**
00	Command	XXX	XX
01	Number of registers to write	—	—
02 – 03	Start address	—	—
04 – 15	Write registers 1 – 6.	—	—

Note that a dash in Dec. or Hex columns above indicates that the value is unimportant and not used for the function described.

8. Remote Access

General

Using a PC with a Web Browser, like Microsoft Edge, it is possible to get access to the instrument set-up and maintenance functions. It is also possible to see a Live View of the instrument display with limited functionality. The PC can be connected to the same network as the instrument, or directly with an Ethernet cable.

Before connecting any instrument to an existing network it should be configured according to the network requirements. Note that the ‘Network Config’ menu is only available with the local user interface on the instrument and not via remote access. The ‘Network Config’ menu is found in ‘Main Menu’. Under ‘Network Config’ menu is the ‘Server Config.’ menu found where the Web Server can be enabled (default) or disabled. Also, the password can be set here.

The remote access interface of the G6 instrument is intended to facilitate the set-up and maintenance work with the instrument. During e.g. commissioning, it will make it possible to have the PC close to the equipment when the instrument is placed away from the equipment. It is possible to access several instruments that are connected to the same network from one location for set-up, diagnostics etc. It is also possible to access instruments over Internet for e.g. remote diagnostics provided that the network allows remote access e.g. using VPN (Virtual Private Network). This requires specific security measures that is the responsibility of the user/network administrator.

Note that the remote access is not intended as an operator interface although it is possible to enter Live View (see section “Live View”). If a remote operator interface is desired, the Modbus TCP (Ethernet), Modbus RTU (serial com.), EtherNet/IP and the Fieldbus interfaces are recommended.

Browser requirements

The Remote Access interface has been tested primarily with Microsoft Edge and Google Chrome browsers. It will probably work with many other browsers but browsers tend to behave differently and some functionality may work or look differently in other browsers. If any problems are encountered, please try Microsoft Edge.

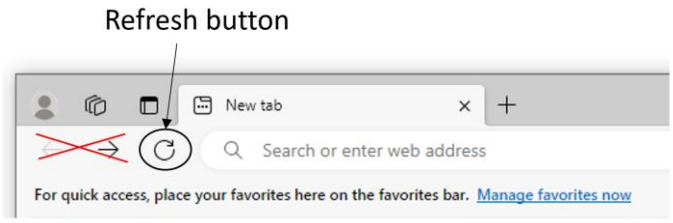
Using the Remote Access

To navigate in the menu system a mouse, touch pad, pointing stick etc. must be used. The keyboard cannot be used for navigation. Hovering with the mouse pointer over a selection in a menu will highlight the item and clicking will open the next menu level or allow for a parameter to be edited. The keyboard is only used when entering values like numbers or texts. The mouse is used to select between parameter choices during set-up.

When moving back (up) in the menu system use the ‘Escape’ button on the screen and not the back button of the browser. This is because browsers commonly caches pages in the PC. Since the pages from the Instrument are dynamic i.e. have a content that is depending on the actual settings a cached page cannot be used. The instrument also keeps track of the currently displayed page (current state) of the menu system and does not allow for multiple pages being displayed simultaneously on different browsers

or tabs. If there is any problem with a page or a page is suspected to be cached and not fresh from the instrument just refresh the page by clicking the refresh button or F5. This will refresh the entire page.

The browser also needs to be refresh after a restart of the instrument. The G6 instrument restarts after a hardware configuration exit, when default values are set, a backup is restored or if it is forced to restart from menu system. A restart takes approximately 20 seconds and reconnects after a refresh of web browser. It is also possible to close the web browser and reconnect when it has restarted.



Refresh button, back and forward buttons not used

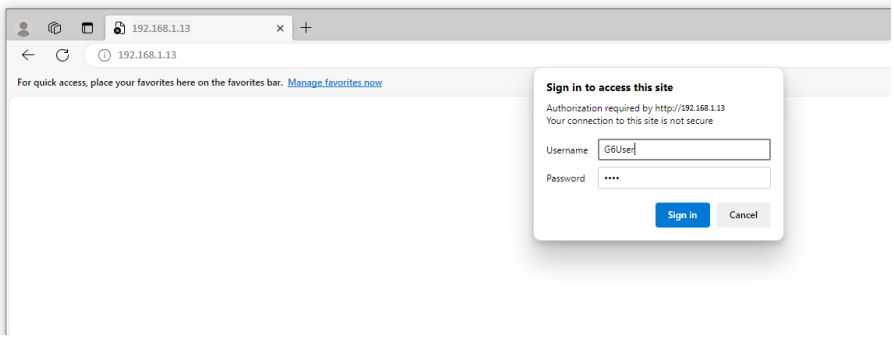
Security

The internal Web Server and Ftp Server use basic authentication that will keep the user ID and password hidden from the average computer user. It will however not provide a secure connection, no encryption etc. It is possible with some simple equipment and knowledge to find out the user ID and password. It is therefore strongly suggested that the set-up and operator locks, in the instrument, are used. It is also recommended to use the login protection on the used PC and to log out while not in use.

Using the instrument connected to the Internet will require specific security measures that are the responsibility of the user/network administrator.

Remote Access Login and Logout

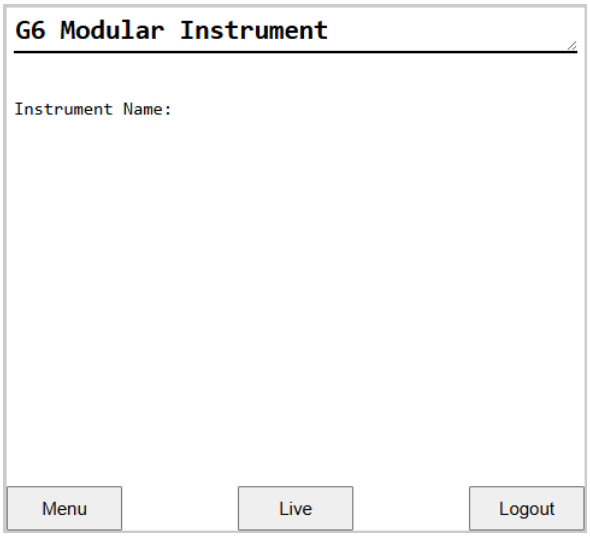
Entering the IP Address of the desired instrument in the address field of the browser will have the instrument Web Server presenting the login form, see the picture below.



Login form

The user ID is always ‘G6User’ (case sensitive) and the password is by default ‘1937’. It is possible to change the password in the ‘Main Menu / Network Config / Server Config.’ menu. Note that the same password (and user ID) also applies to the Ftp server.

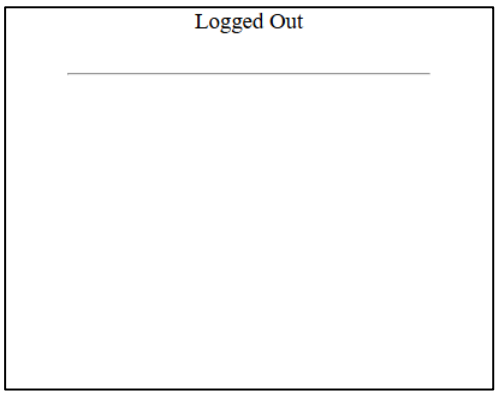
When the correct login credentials are entered the entry screen will be displayed. This picture will show the Instrument Name (if set) or possible start up errors (serious and fatal errors). Any errors shown here must normally be corrected from the instrument and not through remote access. If the start mode of the instrument is ‘Command’ this will be shown on the entry screen. Note that the start command must be given from the instrument front panel or by communication, not from the Remote Access. It is possible to access the menu system even if the instrument is waiting for a manual start command.



Entry screen

Three buttons are available on the Entry Screen. One is the ‘Menu’ button, which will give access to the menu system of the instrument. Clicking the ‘Menu’ button is equivalent to pressing the ‘+’ and the ‘↑’ keys on the instrument front panel simultaneously for 1 second. The second button gives access to a live view of the instrument.

The last button on the Entry Screen is the ‘Logout’ button. Clicking the ‘Logout’ button will logout the user and display the picture shown below.

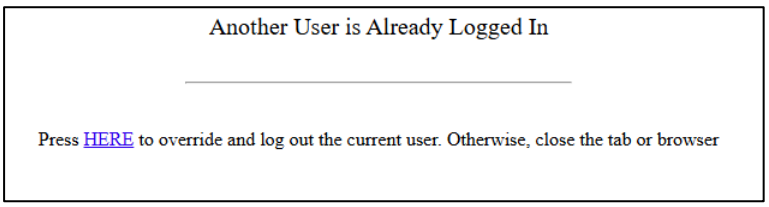


Logged out screen

Note that the browser may save the login credentials which then are proposed as default next time the user tries to login to the same unit.

When a remote access session is finished the user should log out from the entry screen before closing the browser. Also see ‘Remote / Local Access’ below.

If one user is using the Remote Access when another user tries to login he will be presented an override page provided login is accepted. To continue and logout the current user click the ‘HERE’ text (link). The overriding user will continue at the same position in the menu system as the old user was. The override function is intended to give a new user a warning not to interfere with another Remote Access user unconscious. Note that if a user has been idle for 30 min he will be logged out automatically. Next user to log in will continue from the same position in the menu system. Note that if a new user is login in from the same IP-address, an override will occur without an override page.



Override screen

Remote / Local Access

It is possible to access the menu system both locally and remotely simultaneously. It is however not possible to edit from more than one interface at a time. The first to start edit any parameter will get exclusive access to parameter editing. This also applies to e.g. maintenance functions. To release the exclusive access the user must navigate out of the menu system i.e. exit the 'Main Menu' level.

When a remote access session is finished the user should log out from the entry screen before closing the browser, unless intending to continue, to avoid holding the exclusive access rights, which will block a local user from editing parameters or using some maintenance functions. Note that the blocking also will occur in the opposite direction.

To resolve such a blocking situation without being able to access the blocking interface it is possible to restart the instrument using the 'Instrument Restart' function that can be found in the 'Maintenance' menu. This function must be used with caution since it will interrupt all instrument functions while restarting the instrument. Also note that if the 'Start Mode' is set to 'Command' the instrument will wait at start-up for a start command from the instrument front panel or via communication.

There are a few differences between local and remote access. From the Remote Access Interface it is not possible to do Program Upgrade (Maintenance) or Network Configuration (Main Menu). All other functionality is available.

Remote Set-up

All operating functions in the G6 Instrument are controlled by parameters. The parameter values are permanently stored in the instrument and will not be lost when the unit is switched off. At delivery the parameters are factory-set to default values, giving the instrument an initial standard function.

The actual setting of the parameter values can be read and edited during normal measuring operation in sub menu 'Param. Set-up'.

Editing of parameter values can be performed from a browser when connected and logged in to the instrument. After editing hardware parameters, the instrument will be restarted.

In the instrument there are two levels of security locks provided to protect from unauthorized access to instrument functions and editing of parameters and values. The locks are opened by four-digit codes.

WARNING

Changes done during editing of set-up parameters will affect the behavior of the instrument immediately. The user must take all necessary precautions to prevent any undesired effects in the process monitored or controlled by the G6 instrument or a connected control system.

It is strongly recommended to activate the set-up lock in the instrument to prevent any unauthorized changes of set-up parameters.

It's a good practice to make a backup of the set-up after changes have been done. See section 'Maintenance' in this chapter for more information on backup and restore.

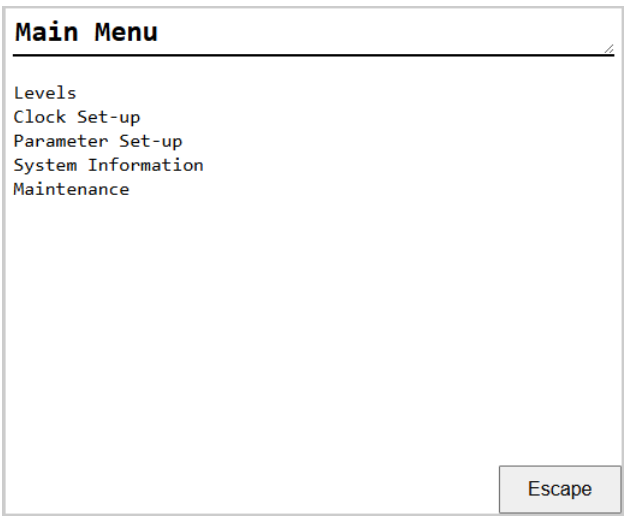
Set-up Parameters

For a description of the menu structure and the set-up parameters available with the Remote Access Interface as well as locally on the instrument see chapters ’Set-up/Menu Structure’ and ‘Set-up/Parameters’ in this manual.

Main Menu

To reach the main menu the user first has to connect to the instrument by entering the IP Address and then (if required) entering the login user ID (G6User) and the password (default 1937, possible to change). This will display the Entry Screen and by clicking the ‘Menu’ button the Main Menu will be displayed.

To open a menu, e.g. Parameter Set-up, simply click on the desired menu.

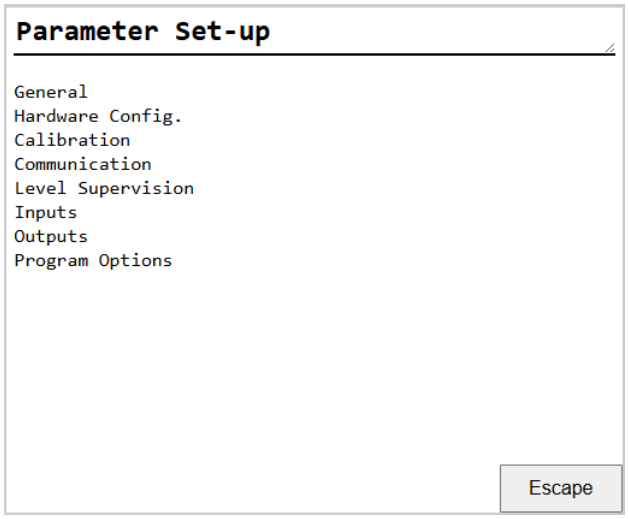


Main Menu

Parameter Set-up menu

If there isn't room for all parameters on screen, it is possible to scroll through the list with the scroll bar at the right of the screen.

Click the 'Escape' button (on the screen) to return to the Main Menu. The 'Escape' button is always used to cancel editing or moving backwards in the menu structure.



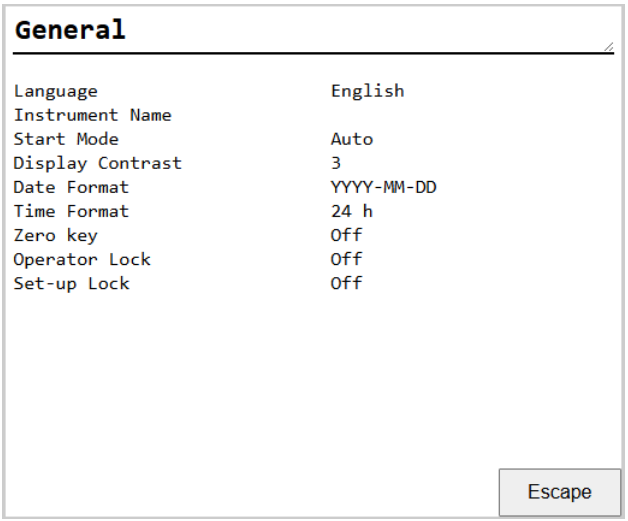
Parameter Set-up menu

Parameter editing

This example shows the 'General' parameter menu but editing is done similar throughout the menu system.

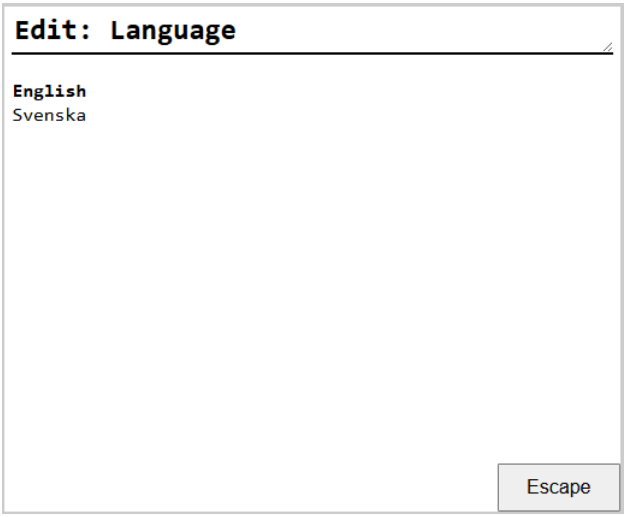
To edit a parameter, simply click on it.

If all items in the menu don't fit on the screen, it is possible to scroll through the list of parameters using the scroll bar at the right of the screen. Click the 'Escape' key to return to the Parameter set-up menu.



General parameters menu

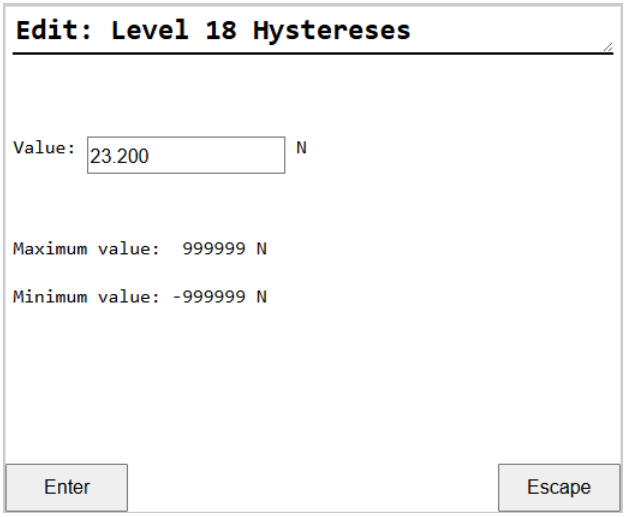
When editing a choice parameter e.g. language as in the figure, a list of available choices is show on screen with the current selection is shown in bold. To change the current selection click on the desired selection. To abort editing and keep the previous setting, click the ‘Escape’ button on the screen. When a selection is made in the editing (new or current) the editing screen is closed and the previous menu is shown.



Editing choice parameter

When editing a numerical parameter e.g. a level hystereses setting as in the figure, the new value should be typed with the keyboard numerical keys. To confirm the new value click the ‘Enter’ button on the screen.

To abort editing and keep the previous setting, click the ‘Escape’ button.



Editing a value parameter

Remote Access Maintenance

General

The Maintenance menu includes several functions used for diagnostics and maintenance purposes. The Maintenance menu is found under the Main menu.

All maintenance functions of the instrument are available from the Remote Access Interface except the ‘Program Upgrade’ and ‘File Handling’. Upgrading the program in the instrument must be done directly on the instrument itself. The communication screen is only showing actual settings of the communication interfaces and not indicating active communication as the display on the instrument.

For file handling, it is recommended to use FTP, see chapter ‘Communication – Ftp Server and file handling’.

Diagnostics

The diagnostics functions cover Function Blocks, Communication, Fieldbus, EtherNet/IP, Digital Inputs, Digital Outputs and Analog Outputs. It is possible to read data and status for the different functions and also in some cases (Digital and Analog outputs) change the output data. If the normal operation has been interrupted (a value or output changed) in a diagnostics menu then the operator will be asked if the diagnostics mode shall be reset when the menu is left. Outputs are always set to normal mode after instrument restart and power up.

Function Blocks

Shows information about all used function blocks, one at the time.

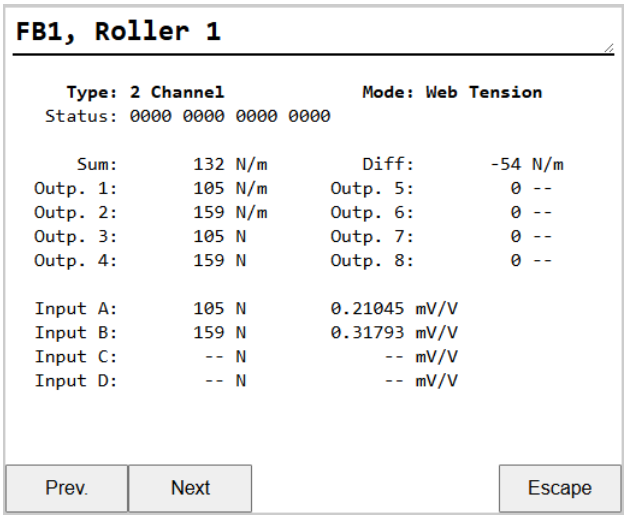
Values with the unit '--' are not used in the current configuration of the function block and in case of error the five lines in the middle ('Sum:' to 'Outp. 4') will be replaced by an error message. A faulty value or a value too large to be displayed (more than 6 digits) is substituted by a number of dashes.

The 'Type' and 'Mode' fields shows how the function block is configured ('Hardware Config.' and 'Calibration').

The 'Status' field represents sixteen discrete data bits and the meaning of each bit can be found in chapter 'Communication' section 'Modbus protocol', 'Function Block X: Status'.

The 'Input A – D' is always the force and input signal values to the function block while the exact meaning of the rest of the values are depending on the current configuration of the function block. A more detailed explanation of the data content can be found in chapter 'Instrument Functionality'. Click buttons 'Prev' or 'Next' to scroll among the used Function Blocks.

The values on screen are automatically updated every 2 seconds.



Function Block diagnostics

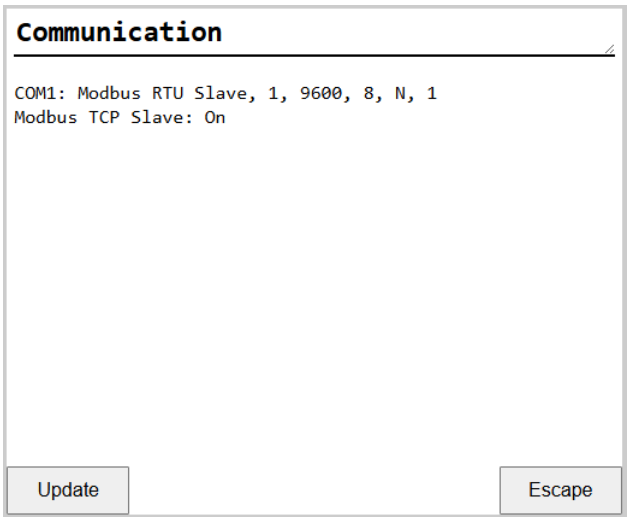
Communication

Shows status for the serial port and the Modbus TCP Slave.

The serial port can be ‘Not In Use’ or ‘Modbus RTU Slave’. In the example below it is in Modbus RTU Slave mode with address 1, 9600 baud, 8 data bits, no parity and 1 stop bit.

The Modbus TCP Slave is either On or Off.

The communications screen is not updated automatically. Click the ‘Update’ button to refresh the page.



Communication diagnostics

Fieldbus

Shows the fieldbus type, address and status of the optional Fieldbus interface.

It also gives the possibility to study the contents in selected parts of the instrument memory (data to and from the fieldbus master). The function is very useful for advanced fault finding in case of problems with the fieldbus communication.

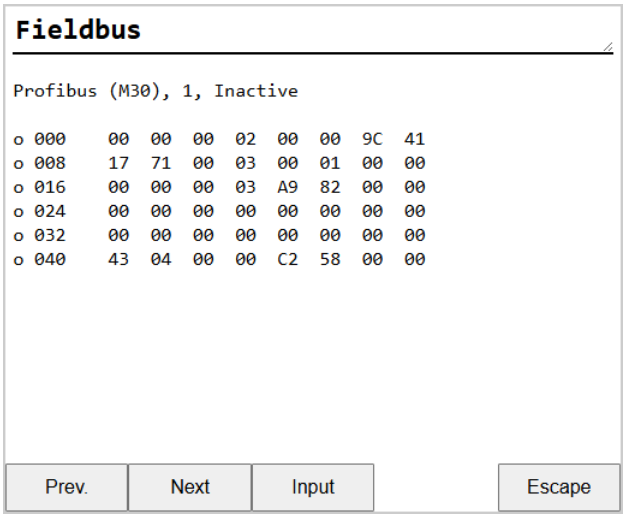
The contents of the output memory (data **to** the fieldbus master) are displayed in hexadecimal form at the six lines of the display. On each line eight byte values are displayed, preceded by 'o' for output and the address of the first byte.

The contents of the input memory (data **from** the fieldbus master) are displayed in hexadecimal form at the six lines of the display. On each line eight byte values are displayed, preceded by 'i' for input and the address of the first byte.

Buttons ‘Prev.’ and ‘Next’ are used to step in the memory.

Use button ‘Input’/’Output’ to change between display of output and input memory.

See chapter ‘Communication’ section ‘Fieldbus interface’ for details on fieldbus data mapping. Data on the screen is updated automatically every 2 seconds.



Fieldbus diagnostics

EtherNet/IP

This screen gives the possibility to study the contents in used instances (data to or from the scanner). The function is very useful for advanced fault finding in case of problems with the communication. For more details, see ‘G6 Multi Channel Force Instrument, EtherNet/IP Program option, Technical Manual Supplement’.

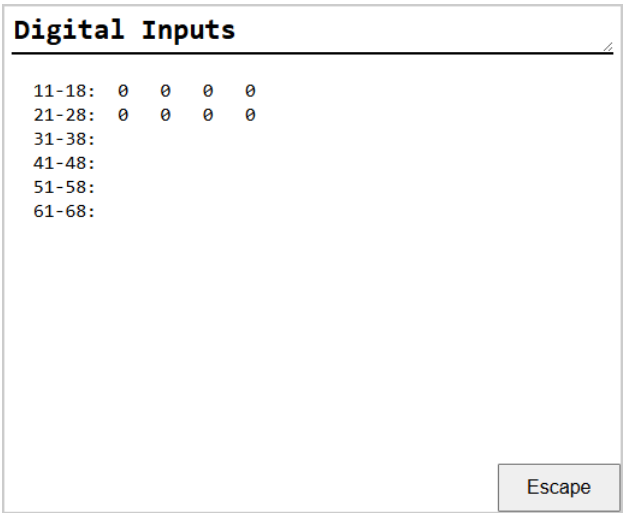
Digital Inputs

Shows the status of digital inputs.

Digital inputs are numbered 11 – 68. Each row corresponds to a slot. Only the currently available inputs in each slot are shown.

The first field on each line is the input numbers for the line and the following digits indicates status of the inputs. A ‘0’ indicates that the input is passive and a ‘1’ means that the input is active.

The screen is automatically updated every 2 seconds.



Digital Inputs diagnostics

Digital Outputs

Shows the status of all digital outputs. It is also possible to change the status of the digital outputs.

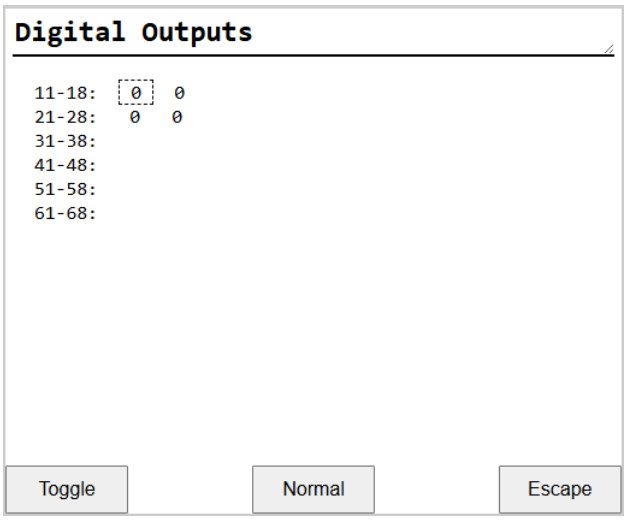
Digital outputs are numbered 11 – 68. Each row corresponds to a slot. Only the currently available outputs in each slot are shown.

The first field on each line is the outputs numbers for the line and the following digits indicates status of the outputs. A ‘0’ indicates that the output is passive and a ‘1’ means that the output is active.

An output is selected by clicking with the mouse on the desired output. A dashed frame around the digit in the symbol indicates a selected output.

Press ’Toggle’ to force the selected output. The first time the button is clicked will set the output in diagnostics mode keeping the current state. Each time the ’Toggle’ button is clicked while in diagnostics mode will toggle the output. To restore the output to normal operation click ‘Normal’ button. An output in diagnostics mode (manually forced to a state) is marked with a grey background.

The screen is automatically updated every 2 seconds.



Digital Outputs diagnostics

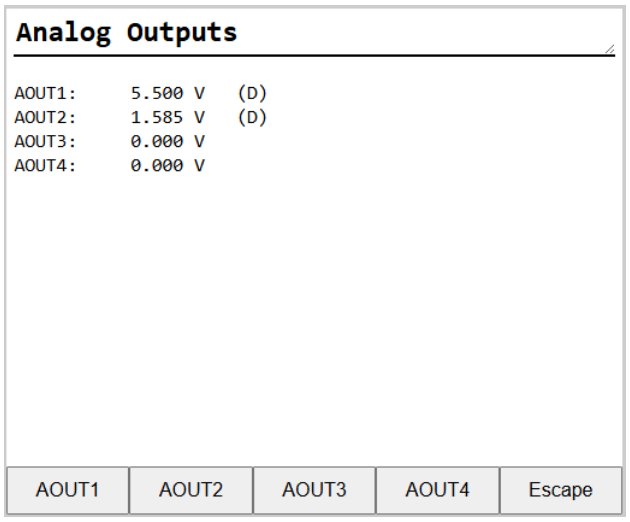
Analog Outputs

Shows the output value or a possible error message for installed analog outputs.

It is also possible to override the normal operation and set the output value for each analog output. To change an output value click the button marked with the output number and enter wanted value. To restore an output to normal operation, click the corresponding button ‘AOUT1’ – ‘AOUT4’ and then click the button ‘Normal’.

A ’(D)’ at the end of a line indicates that the output is manually set (in diagnose mode).

The screen is automatically updated every 2 seconds.



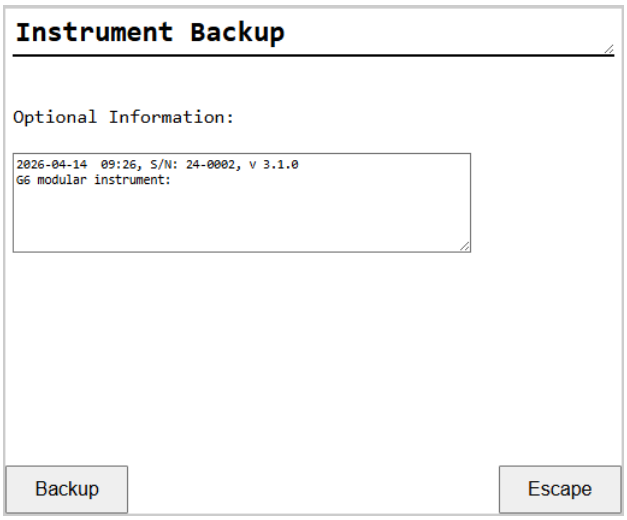
Analog Outputs diagnostics

Create Backup

Parameter values are stored in a file that can be used to restore to same or other instruments of the same type. The back-up file will be saved on the PC. The file name can be edited. Note that additional information, which is saved in the backup file, can be added before the backup file is created.

Using the Create backup requires either a Set-up Code or an Operator Code if a lock is activated.

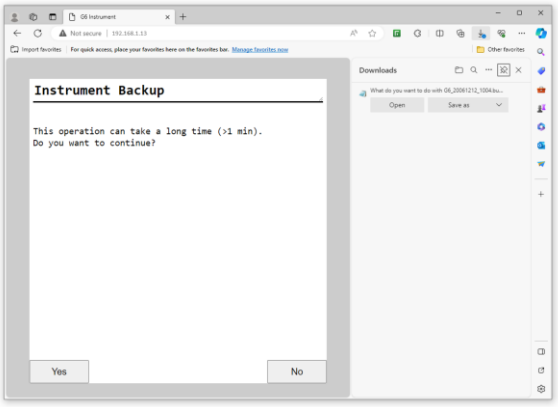
After entering a possible Code the Optional Information screen is displayed. Here it is possible to add more and/or change the default information in the text box.



Optional Information screen

When satisfied with the Optional Information the user should click the ‘Backup’ button to continue. The user will then be shown a warning message that says that the backup procedure can take more than a minute to perform.

Clicking the ‘Yes’ button will start the backup procedure and when the backup is done, it is possible to open/save the file. How to download or open the file will vary depending on the browser and its settings and the image below shows one example.



Open/Store file screen (example)

When the file has been opened or saved, click the ‘No’ button to leave the backup screen.

Restore Backup

Restoring a previously stored parameter backup to the instrument. Any additional information in the backup file is displayed before a backup file is restored. Backup files are fetched from the PC. Using the Restore Backup requires either a Set-up Code or an Operator Code if a lock is activated.

After entering a possible Code a file selection screen is displayed. Clicking the 'Browse…' button will display a file selection popup window. Chose the desired backup file and click the 'Open' button. The chosen file name is shown on the screen. Click 'Next' button to continue the restore procedure.

After a short delay the optional information for the selected backup file is displayed. Verify that the backup file is the desired and click the 'Restore' button. The user will then be shown a warning message that says that the restore procedure will take a long time to perform. Click the 'Yes' button to perform the restore. The connection with the instrument will be lost. When the restore is finished within the instrument it will automatically restart. Thereafter it will be possible to reconnect to the instrument e.g. by refreshing the page.

Set Default

Restore of the instrument settings to the default values that can be found in the Technical manual. Note that default values may differ from the setting that where in the instrument at delivery.

All Zero correction values and Levels will be set to zero when executing a default set-up. Using the Set Default requires either a Set-up Code or an Operator Code if a lock is activated.

After entering a possible Code, a warning message is displayed. Click the 'Yes' button to perform the default set-up. The default set-up procedure will take some time and the connection with the instrument will be lost. When the default set-up is finished the instrument it will automatically restart. Thereafter it will be possible to reconnect to the instrument e.g. by refreshing the page.

Instrument Restart

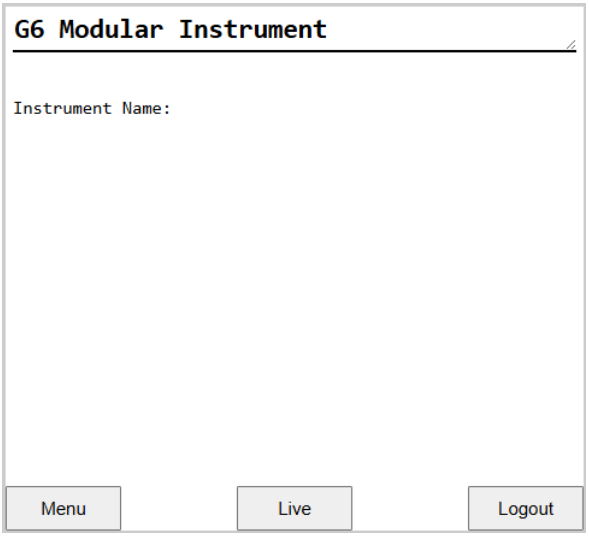
With the Instrument Restart function it is possible to force the instrument to make complete restart (corresponding to a power down – power up cycle). This must be used with great caution especially if done from a remote position. The user must make sure that no hazardous situation will occur.

To use the Instrument Restart function requires either a Set-up Code or an Operator Code if a lock is activated.

Note that the Instrument Restart function can be used even if a local user has exclusive access to parameter editing or maintenance functions. The purpose of this is to be able to resolve a blocking between local and remote user.
When the user have selected the Instrument Restart function and entered a possible Code he will be asked: "Restart Instrument?" If clicking Yes a warning message is displayed. Clicking Yes will make the instrument restart. When the instrument is restarting, the browser will lose the connection with the instrument. The browser will display an error message that the connection has failed.
A restart will normally take about 20 seconds. When the instrument has restarted, it will be possible to reconnect to the instrument e.g. by refreshing the page.

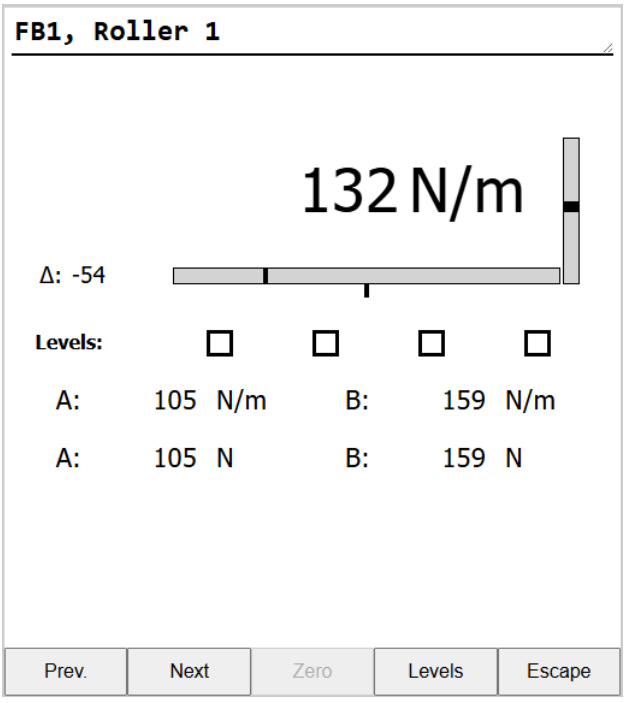
Live View

On the entry screen, the button “Live” will give access to a Live View of the instrument.



Entry screen with the Live button

With the Live View functionality, it is possible to monitor single function blocks as on the instrument display. The buttons ‘Prev.’ and ‘Next’ will be shown if more than one function block is configured. They are used to toggle between the blocks.



Live View screen

9. Maintenance

General

This chapter describes the maintenance functions when handled from the local display.

The Maintenance menu includes a number of functions used for diagnostics, maintenance and program upgrade purposes. The Maintenance menu is found under the Main menu.

From any of the operating views, displaying the main menu is done by pressing '+' and '↑' keys simultaneously for 1 second.

The ViewPan '+' and '–' keys are used to scroll between the available menu items and the '↵' key is used to enter the selected sub menu or start editing a value. Pressing the '↑' key will make the instrument step backwards in the menu system or cancel an ongoing editing operation.

Diagnostics

The diagnostics functions covers Function Blocks, Communication, Fieldbus, EtherNet/IP, Digital Inputs, Digital Outputs and Analog Outputs. It is possible to read data and status for the different functions and also in some cases (Digital and Analog outputs) change the output data. If the normal operation has been interrupted (a value or output changed) in a diagnostics menu then the operator will be asked if the diagnostics mode shall be reset when the menu is left. Outputs are always set to normal mode after instrument restart and power up.

Function Blocks

Shows information about all used function blocks, one at the time.

Select a Function Block number using the '+' and '–' keys from the 'FB Diagnostics' menu and press Enter. Now it is possible to scroll through the available information for the Function Block.

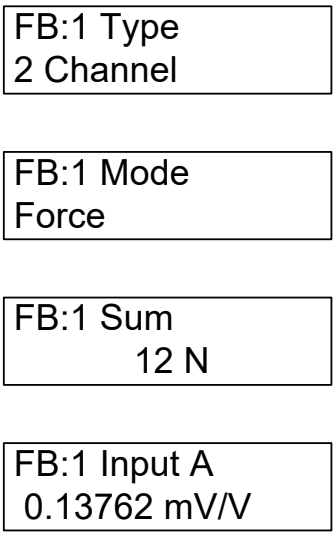
In case of an error, an error number will replace the value. A faulty value or a value to large to be displayed (more than 6 digits) is substituted by a number of dashes.

The 'Type' and 'Mode' shows how the function block is configured ('Hardware Config.' and 'Calibration').

The 'Status' represents sixteen discrete data bits and the meaning of each bit can be found in chapter 'Communication' section 'Modbus protocol', 'Function Block X: Status'.

The 'Input A – D' is always the force and input signal values to the function block while the exact meaning of the rest of the values are depending on the current configuration of the function block. A more detailed explanation of the data content can be found in chapter 'Instrument Functionality'.

Some examples of displays are shown in the figure to the right.



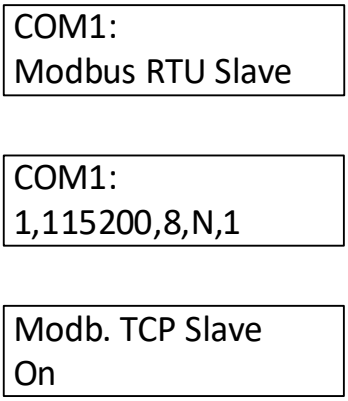
Function Block Diagnostics

Communication

Shows status for the serial port and the Modbus TCP Slave. The serial port uses two displays to show the information. First display shows the use of the serial port and the second display shows the settings.

When a correct message is received the corresponding header text will blink. In the example to the right, 'COM1:' is in Modbus RTU Slave mode with address 1, 115200 baud, 8 data bits, no parity and 1 stop bit.

The Modbus TCP Slave is either On or Off. When a correct message is received the header will blink.



Communication diagnostics

Fieldbus

Shows the fieldbus type, address and status of the optional Fieldbus interface.

It also gives the possibility to study the contents in selected parts of the instrument memory (data to and from the fieldbus master). The function is very useful for advanced fault finding in case of problems with the fieldbus communication.

The contents of the output memory (data **to** the fieldbus master) are displayed in hexadecimal form with two lines on the display. On each line four byte values are displayed, preceded by 'o' for output and the address of the first byte.

The contents of the input memory (data **from** the fieldbus master) are displayed in hexadecimal form with two lines on the display. On each line four byte values are displayed, preceded by 'i' for input and the address of the first byte.

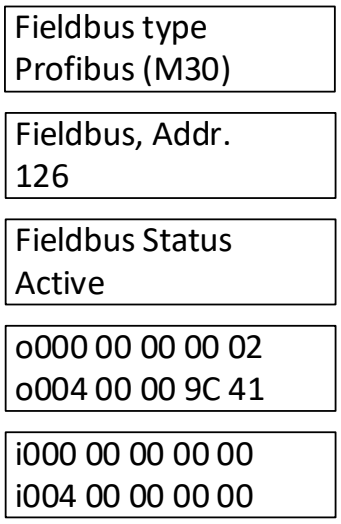
The '+' and '–' keys are used to step forwards / backwards in the memory.

Use key '↵' to change between display of output and input memory.

When entering the fieldbus menu, fieldbus type is shown. Press the "+" key to display the fieldbus address. Press "+" key again and fieldbus status will be shown. By continuing to press the "+" key, memory data will be shown. Press the "↑" key to leave fieldbus menu.

See chapter 'Communication' section 'Fieldbus interface' for details on fieldbus data mapping.

The figure on the right shows some examples of how the fieldbus diagnostics display might look.



Fieldbus diagnostics

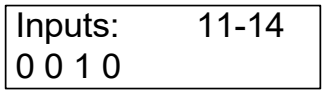
EtherNet/IP

Shows the contents in used instances (data to or from the scanner). The function is very useful for advanced fault finding in case of problems with the communication. For more details, see 'G6 Multi Channel Force Instrument, EtherNet/IP Program option, Technical Manual Supplement'.

Digital Inputs

Shows the status of installed digital inputs.

The upper row shows the input numbers for the selected card slot in the instrument and the digits on the lower row indicates the current available inputs in the slot. A '0' indicates that the input is passive and a '1' means that the input is active.

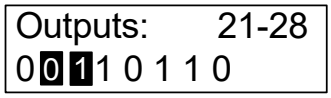


Digital Inputs diagnostics.

Digital Outputs

Shows the status of installed digital outputs. It is also possible to change the status of the digital outputs.

The upper row shows the output numbers for the selected card slot in the instrument and the digits on the lower row indicates the current available outputs in the slot. A '0' indicates that the output is passive and a '1' means that the output is active.



Digital Outputs diagnostics

An output is selected by pressing '↵' one or several times until the desired output is marked with a flashing cursor.

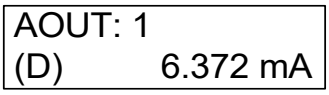
To force the selected output to 'Off' press '+' or '–' key until an inverted zero (white digit on black background) is displayed. Press '↵' key one second to confirm the choice. To force the selected output to 'On' press '+' or '–' key until an inverted one (white digit on black background) is displayed. Press '↵' key one second to confirm the choice. To restore an output to normal operation, select the desired output by pressing '↵'. Then press '+' or '–' key until a 'N' is displayed and confirm by pressing '↵' one second.

An output in diagnostics mode (manually forced to a state) is shown with an inverted zero or one.

Analog Outputs

Shows the output value or a possible error message for installed analog outputs. Selecting between the analog outputs is done with the '+' and '–' keys.

It is also possible to override the normal operation and set the output value for each analog output. To change an output value press the '↵' key and enter the new value. Press '↵' key one second to confirm the entry.



Analog Outputs diagnostics

To restore an output to normal operation press the '↵' key and answer Yes on the 'Normal mode?' question. Answer No to edit the analog output value.

A '(D)' at beginning of the bottom row indicates that the output is manually set (in diagnose mode).

File Handling

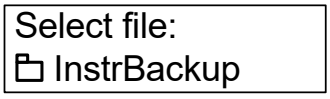
File handling is used for copying, moving (renaming) and deleting files.

Files can be copied and moved between folders in the instrument and between a USB memory and the instrument (both to and from the USB memory). A file can be renamed while copying or moving.

It is possible to delete files stored in the instrument and on a USB memory.

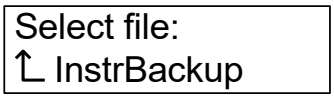
The file handling has access to the ‘user tree’ directory structure in the instrument. The default folders are ‘InstrBackup’, ‘LogFiles’, ‘Misc’ and ‘Recipes’. The folder ‘InstrBackup’ is used as default when creating or restoring backup.

In the figures to the right are some symbols shown that are used in File Handling menus and also in Program Upgrade.



Folder symbol

The folder symbol is added in front of folder names to distinguish folders from files. If ‘↵’ key is pressed, when the folder symbol is shown, the shown folder will be used as the current folder.



Up symbol

The ‘Up’ symbol and the current folder name are always displayed, unless at the root level, as the first item of the content of the current folder. In the example to the right, the current folder is InstrBackup.

With the ‘+’ and ‘–’ keys can the user scroll through the contents of the current folder viewing one folder or file at a time on the display.

If ‘↵’ key is pressed, when the Up symbol is shown, the folder one level up will be used as the current folder.

A USB memory is shown as ‘USB’ and will also be shown with Up symbol added when USB content shown. If more than one USB memory is connected through an USB-hub they will be shown as USB, USB2, USB3, etc.

Note that a filename or folder name is truncated if more than 16 characters are used.

File handling always starts with selecting the desired file. When pressing ‘↵’, as the desired filename is shown, the user is requested to select an action. The ‘+’ and ‘–’ keys are used when selecting file handling action. The ‘↵’ key is pressed to execute the selected action. The user can choose between Abort (Abort file handling), Delete file, Copy file and Move file.

The user will be requested to select a destination, where the file should be copied or moved to, when selecting copy or move.

When copying a file the text ‘**Copy to here**’ will be shown as the second ‘item’ when scrolling through the current folder.

When moving a file the text ‘**Move to here**’ will be shown.

When in the destination folder, press ‘↵’ when the text ‘**Copy to here**’ or ‘**Move to here**’ is shown. When copying or moving the user will be asked if the file name should be edited. If a file with the same name already exists in the destination folder, the user will have to confirm before overwriting.

To rename a file choose move file to the source folder and edit the filename.

If there are problems with file copy or file move it might be because of insufficient memory. Try removing unnecessary files in the user tree.

Create Backup

Parameter values are stored in a file that can be used to restore to the same or other instruments of the same type. The user can select to save the back-up file, either in the instrument or on a connected USB memory. The file name cannot be edited while creating the backup. The backup file will automatically be assigned a file name. The file name will look like:

G6_YYYYMMDD_HHMM.BUP where

YYYY is the year, MM is the month, DD is the date, HH is the hour and MM is the minute of the backup file creation date and time.

If the user needs to change the backup file name, the file can be renamed afterwards by using the File handling in the instrument.

Restore Backup

Restoring a previously stored parameter backup to the instrument. Backup files can be fetched from internal memory or from a USB memory. After selecting restoring from Internal file (folder InstrBackup) or USB (root) all .BUP files are shown. The user can scroll through existing .BUP files with '+' and '–' keys. The desired backup file is selected by pressing the '↵' key.

Note that all files with extension .BUP will be shown and possible to use for restore and not only files with the automatically created file name described under Create backup.

Set Default

Setting the set-up parameter values to factory default settings. All Zero offsets and Levels will also be reset to zero when executing a default set-up.

Program Upgrade

Upgrading the program with a different version.

Upgrading is normally done from a USB memory. When upgrading the user is asked to select the version to upgrade to by selecting an ‘Upgrade.txt’ file that is situated within the folder containing all files and folders necessary for program upgrade. When upgrading is done (a success message is displayed) the instrument will be restarted. Note that it may take a few minutes for the instrument to restart after upgrading.

In case of failure when upgrading an error message will be displayed and the user will be given a possibility to recover from the failed upgrade. Corrupt files or malfunctioning USB memory are possible causes of upgrade failure.

Note that the folder containing the program upgrade must not be tampered with but always handled as a whole. Any changes are likely to make the upgrade worthless and making the instrument defective.

See File Handling above for a description of how to navigate in the file system.

All Zero correction values and Levels will be set to zero when a successful program upgrade is performed.

Note that several MB of free internal flash disk memory is required to be able to perform a program upgrade. If the upgrade fails, due to file copy error, try to free some space in the ‘user tree’ area by using the ‘File Handling’ maintenance function to remove unnecessary files. It is also possible to use an ftp (File Transfer Protocol) client to access the user area from an external computer over an Ethernet connection. See chapter ‘Communication – Ftp Server and file handling’.

Instrument Restart (Instr. Restart)

With the Instrument Restart function it is possible to force the instrument to make complete restart (corresponding to a power down – power up cycle). This must be used with great caution. The user must make sure that no hazardous situation will occur.

To use the Instrument Restart function requires either a Set-up Code or an Operator Code if a lock is activated.

Note that the Instrument Restart function can be used even if a remote user has exclusive access to parameter editing or maintenance functions. The purpose of this is to be able to resolve a blocking between local and remote user.

When the user have selected the Instrument Restart function and entered a possible Code he will be asked: “Restart instr?” Pressing the Yes button will make the instrument restart.

After some time, approximately 20 seconds, the instrument will be in operation again.

10. Troubleshooting

General

During installation and maintenance of the G6 Instrument, the sub menus ‘System Info.’ and ‘Maintenance / Diagnostics’ can be useful for solving possible problems related to I/O modules, Ethernet, Serial Communication etc.

The instrument reports detected errors on the display. Error codes can also be read via communication.

When an error is detected for a Function Block, all digital outputs are set passive and the analogue outputs are set to 0 V or 0 mA for outputs configured for that Function block.

The output signal ‘In Process’ is set passive if an error is detected.

The optional fieldbus interface adapters have LED’s for indication of status.

Error codes

This part provides explanations of the error codes.

Some errors are displayed on the instrument display, containing a description of the error and the error code.

Reading error codes is done by Modbus and by the optional Fieldbus. Error code registers are ‘Instrument error’, ‘Command error’ and Function Blocks error code registers (see chapter ‘Communication’).

The error codes are divided in four groups, depending on their origin:

- **Force errors** occur when transducer signals or force values go out of given ranges.
- **Start-up errors** occur only during start-up.
- **General errors** usually occur due to faulty entries from the front panel, alternatively invalid data or not allowed commands from the control unit.
- **Set-up errors** can only occur during instrument set-up.

On the following pages a summary of all error codes is given (note that code 000 always means 'no error').

Note that there are some error codes of internal type not described below. If an error code is displayed that is not listed below try restarting the instrument and if the error persists please contact your supplier.

Force errors

The indication is either temporary or stays on until the cause is cured.

Error code	Explanation
000	**No error.** The instrument is in 'normal state' and no error is detected.
x003	**Instrument not in normal state.** Force/Web Tension values are not valid.
x005	**Over range** Over range means that the input signal from the transducer exceeds the operating range.
x007	**Under range** Under range means that the input signal from the transducer is below the operation range.
x010	**Exicitation short-circuit** Either a short-circuit in the excitation circuit or too many transducers connected. (A fault in a transducer or inside the instrument is also possible.) Check transducer connections. See chapter 'Installation'.
x011	**Sense voltage error** The sense voltage is out of range. Check transducer connections. See chapter 'Installation'.
x012	**Transducer signal error** The input signal is out of range, for example due to a faulty or missing transducer connection. (A fault in a transducer or inside the instrument is also possible.) Check transducer connections. See chapter 'Installation'.
x014	**Invalid input signal** Invalid input signal is reported while the instrument is waiting for sufficient conversion data to calculate a valid force value. This indication is reported during power-up since input value might be momentarily unreliable.
x020, x191	**Too many digits** The actual value with the configured number of decimals is exceeding 6 digits.

The 'x' in the error code may be omitted (blank) or a digit (1-4). A digit indicates that the error comes from a certain Function Block input. The digit '1' corresponds to Function Block Input A, the digit '2'' to input B etc.

Start-up errors

These error codes can only appear during start-up.

Error code	Explanation
081	**Set-up data error** Indicates faulty set-up. Enter set-up mode, perform the necessary editing and save the new parameter settings or use the “Set Default values” function (Maintenance menu).
082	**Set-up and installed I/O modules do not match** The I/O-modules in the instrument doesn’t correspond to the set-up. Correct the set-up or change modules.
083	**Wrong type of Fieldbus Module** The fieldbus module in the instrument doesn’t correspond to the set-up. Correct the set-up or change module.
084	**No Fieldbus Module** There is no fieldbus module installed in the instrument but the set-up indicates there should be a fieldbus module. Correct the set-up or install the desired module.
085	**Fieldbus Module Error** There are some kind of error when configuring the fieldbus module. Check the status LED’s on the module, check that the set-up correspond to the network configuration, baud rate, addresses etc.
090	**Failed to start the real time system** Some error occurred when the real time dll was accessed during start up. Restart the instrument and if the error persists contact your supplier.
091	**Database error** An error occured when the program tried to access the internal parameter database. To correct the problem first restart the instrument. If the error persists the database file can be deleted. The instrument will create a new database with default settings during restart. Upgrading the program (also reinstalling the present version) will also force a new database with default settings to be created. If the error still persists contact your supplier.
092	**Non-volatile memory error** An error occurred when the program tried to open, create or map the file for Non-volatile memory. To correct the problem, restart the instrument. If the error persists the file for Non-volatile memory can be cleared. The instrument will create a new file for Non-volatile memory with default settings during restart. Upgrading the program (also reinstalling the present version) will force a new file for Non-volatile memory with default settings to be created. If the error still persists contact your supplier.

General errors

These errors generally occur due to faulty entries from the front panel, alternatively invalid data or not allowed commands from the control unit.

Error code	Explanation
008	**Input channel not used** The Input channel is not configured (used) in the instrument. If all inputs have error code 8, the start-up may have failed, restart the instrument.
009	**Function Block not used** The Function Block is not configured (used) in the instrument.
060 - 063	**AOUT ch X termination error** There is a termination error on an analog output channel. Too low impedance on a voltage output or too high impedance on a current output may cause this error.
070	**I/O module communication error** There is an internal error in the communication between the CPU module and one or more of the I/O modules. Restart the instrument and contact the supplier if the error persists.
071 - 074	**I/O module reset** There has been an internal reset within an I/O module. Restart the instrument and contact the supplier if the error persists.
100	**Instrument in wrong state** The transmitted command is not applicable to the present instrument mode.
101	**Too high value!** Value over allowed range. Compare with restrictions for the parameter.
102	**Too low value!** Value under allowed range. Compare with restrictions for the parameter.
103	**Illegal start address.** Illegal Modbus start address, when writing data to the G6 instrument.
104	**Illegal number of registers.** Illegal number of Modbus registers, when writing data to G6 instrument.
105	**Faulty value** Value not accepted when entering a parameter from front panel or illegal data in Modbus registers, when writing data to the G6 instrument.
113	**Outside zero setting limits.** Any Force value in a Function Block is outside allowed zero setting range.
118	**Zero setting not allowed.** Zero setting is not allowed when the calibration menu is displayed for the actual Function Block.
240	**Fieldbus command error.** Command error response on fieldbus connection. Indicates that the command sent to the G6 instrument via the fieldbus could not be executed.
249	**Internal Timeout** A internal timeout occurred. If this error occurs when a command is sent to the instrument, try the command again. Restart the instrument or contact the supplier if the error persists.

Set-up errors

These errors occur only during instrument set-up from the front panel.

Certain errors depend on more than one set-up parameter and it is the operator's responsibility to locate and correct all faulty set-up parameters.

Error code	Explanation
151	**Input signal error** The input signal is not valid during calibration. Check the live force and input signal at the bottom of the display in calibration menus.
152	**Unstable transducer signal used** This is not an error but only a warning. The force was not stable during calibration which might reduce the accuracy of the calibration. Wait a little longer and try again. If the problem persist, check the mechanical and electrical stability of the installation, check the live force and input signal after the parameters in the calibration menus.
155	**Illegal calibration direction** All forces with corresponding mV/V values must be increasing for increasing calibration point number.
156	**Calibration not finished (all calibration points not stored)** This warning is given if the user is leaving the calibration menu when a known force calibration is started but not all calibration points are stored. The user will have the possibility to continue calibration, leave the menu and discarding all calibration changes or leave the calibration menu and keeping the calibration changes done so far. Note that leaving an unfinished calibration might give a faulty calibration of the Function Block.
158	**Wrong program option code.** The entered program option code is not valid. Check that the code is correctly entered, that the code is intended for the used CPU S/N (See menu System Info) and that the used program version is correct (i.e. a program that includes the program option desired, see menu System Info).
159	**Not allowed to turn the program option Off.** It is not allowed to turn off the program option in the current situation.
192	**Too high transducer signal in calibration point 2** The mV/V signal in calibration point two is too high (often due to a previous, strange calibration).
194	**Illegal calibration direction.** All forces with corresponding mV/V values must be increasing for increasing calibration point number.
195	**Illegal I/O module configuration** The I/O-module set-up (Hardware Configuration menu) is not consistent with the allowed number of modules of the different types or the allowed combinations of modules.
197	**Illegal Function Block input configuration** Each transducer input must only be used once. See menu 'Hardware Configuration'.
198	**Illegal Function Block input configuration** None existing transducer input used. See menu 'Hardware Configuration'.

Error code	Explanation
199	**Illegal Function Block input configuration** No transducer input selected for a Function Block (each Function Block must have at least one transducer input assigned). See menu ‘Hardware Configuration’.

Publication no. 601 751 R3
© Vishay Nobel AB, 2026-04-29
Subject to changes without notice.

Vishay Nobel AB
Skrantahöjdsvägen 40G,
SE-691 46 Karlskoga, Sweden
Phone +46 586 63000
blhnobel.se@vpgsensors.com
www.blhnobel.com

BLH
951 Wendell Blvd, Wendell,
NC 27591, USA
Phone: 781-298-2200 Fax: 781-762-3988
blhnobel.usa@vpgsensors.com
www.blhnobel.com