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Operating Instructions

MG3D
Digital Measuring Unit



Annex: Safety Regulations
General References on Resistance Welding
Contact Addresses

Order number:		**Year:**	
Serial number:			

Versions		
Version	Date	Basis of revision
1.0	2002-11	new
1.01	2003-04	Corrections
1.02	2003-07	Software changes
1.03	2003-11	Plug assignment / Indices
1.03a	2004-02	Only English corrections
1.03b	2004-05	Checked CompactFlash
1.03c	2004-09	Only Czech corrections: Screenshots
1.1	2004-11	CanOpen; Pressure/Force; Measurement values; field bus
1.1a	2005-03	Miyachi-Peco
1.2a	2005-09	Safety regulations separate and div. small changes
1.3	2006-05	Diagrams 6.10 added, declaration by the manufacturer
1.3a	2007-04	Declaration of Conformity
1.3b	2008-07	Symbols changed
1.4	2009-09	New design (Spanish only)
1.5	2010-03	Flow diagrams new
1.6	2010-08	CE new Machinery Directives

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1 General Information

Information about copyrights, protection rights, symbols, safety regulations, usage location conditions and notes on resistance welding can be found in the annex of the operating instructions.
Please read this information carefully before using the individual elements of the AWS welding system.

Information
These **device-specific operating instructions** should help you familiarize yourself with the unit and take advantage of its application possibilities when used as directed.
The Operating Instructions contain important notes to help operate the unit safely, properly, and economically.
Observing the notes will help avoid risks, decrease repair costs and down times, and enhance reliability and the service life of the unit.

1.1 Declaration of Conformity

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EG-Konformitätserklärung im Sinne der EG-Richtlinien		EC Declaration of Conformity according to EC guidelines
- Maschinenrichtlinie - Elektromagnetische Verträglichkeit (EMV) - Niederspannungsrichtlinie	2006/42EG, App. II A 2004/108/EG/EC/UE 2006/95/EG/EC/UE	- Machinery Directive - Electromagnetic Compatibility (EMC) - Low Voltage Directive
Hiermit erklären wir, dass die nachfolgend beschriebene Maschine/ Anlage in alleiniger Verantwortung unserer Firma von uns in Übereinstimmung mit den oben genannten EG-Richtlinien entwickelt, konstruiert und gefertigt wurde und allen einschlägigen Bestimmungen der Maschinenrichtlinie 2006/42/EG entspricht.		Hereby we declare that the in the following described installation / machine has been developed, designed and manufactured in the sole responsibility of our company in accordance with the above-mentioned EC-guidelines and is complying with all essential requirements of the Machinery Directive 2006/42/EC.

Produktbezeichnung	Serie, Typ / Model, Type	Product Denomination
Messgerät	MG3D	Measuring Unit
Serien-Nr. und Baujahr siehe Deckblatt der Anleitung		Serial-N°. and Year see Cover Sheet of Instructions
Hersteller		Manufacturer
Miyachi Europe GmbH; Lindberghstraße 1; D–82178 Puchheim; Deutschland / Germany		

Angewandte harmonisierte Normen		Harmonized Standards Used
Widerstandsschweißeinrichtungen Teil 1: Sicherheitsanforderungen für die Konstruktion, Herstellung und Errichtung	EN 62135-1	Resistance welding equipment Part 1: Safety requirement for design, manufacture and installation
Widerstandsschweißeinrichtungen Teil 2: Anforderungen an die elektromagnetische Verträglichkeit (EMV)	EN 62135-2	Resistance welding equipment Part 2: Electromagnetic compatibility (EMC) requirements
Mindestabstände zur Vermeidung des Quetschens von Körperteilen	EN 349	Minimum gaps to avoid crushing of parts of the human body
Zweihandschaltungen – Funktionelle Aspekte	EN 574	Two-hand control devices - Functional aspects
Trennende Schutzeinrichtungen - feststehenden und beweglichen trennenden Schutzeinrichtungen	EN 953	Guards - General requirements for the design and construction of fixed and movable guards
Anordnung von Schutzeinrichtungen im Hinblick auf Annäherungsgeschwindigkeiten von Körperteilen	EN 999	The positioning of protective equipment in respect of approach speeds of parts of the human body
Vermeidung von unerwartetem Anlauf	EN 1037	Prevention of unexpected start-up
Verriegelungseinrichtungen in Verbindung mit trennenden Schutzeinrichtungen	EN 1088	Interlocking devices associated with guards -
Sicherheitsbezogene Teile von Steuerungen - Gestaltungsleitsätze - Validierung	EN 13849-1 EN 13849-2	Safety-related parts of control systems General principles for design Validation
Not-Halt-Gestaltungsleitsätze	EN 13850	Emergency stop - Principles for design
Sicherheitsabstände Gefährdungsbereiche	EN 13857	Safety distance to prevent access to danger zones
Leitsätze zur Risikobeurteilung	EN 14121-1	Principles for risk assessment
Maschinenintegrierte Beleuchtung	EN 1837	Integral lighting of machines

Diese Erklärung bezieht sich nur auf den Zustand, in dem sie in Verkehr gebracht wurde; vom Endnutzer nachträglich angebrachte Teile und/ oder nachträglich vorgenommene Eingriffe bleiben unberücksichtigt. Die Erklärung verliert ihre Gültigkeit, wenn das Produkt ohne Zustimmung umgebaut oder verändert wird.	This declaration relates exclusively to the machinery in the state in which it was placed on the market, and excludes components which are added and/or operations carried out subsequently by the final user. The declaration is no more valid, if the product is modified without agreement.
Eine technische Dokumentation ist vollständig vorhanden.	A technical documentation is completely available
Bevollmächtigter für die technischen Unterlagen:	Authorized person for the technical documentation:

Puchheim,
30.04.2010
Datum / Date

Bevollmächtigter / Authorized Person:
Susumu Ueda
Miyachi Europe Corporation
Lindberghstr. 1
D-82178 Puchheim

Unterschrift Bevollmächtigter / Signature of authorized person

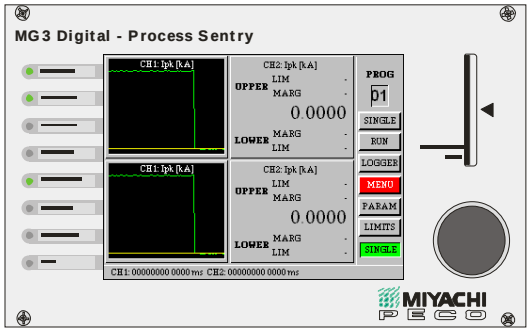
CE-MG3-DE.docx Version: 2.0 Ausgabe: 30.04.2010

2 Technical Description

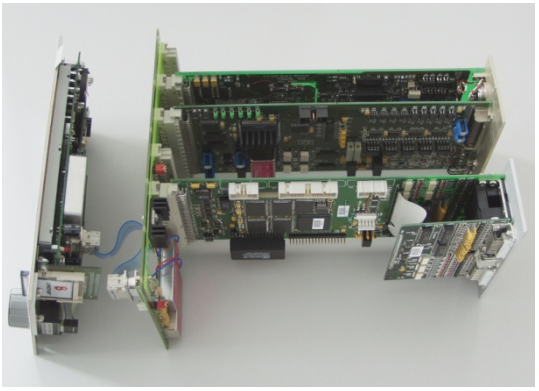
2.1 Design and Mode of Action

Measuring instrument MG3 comprises:

Operator and
display module (Display)



PCB holder and



housing with built-in power
supply



The housing dimension is 1/2 x 19 in. The MG3 can also be supplied in a 19 in. housing then offering space for an additional control unit.
Data transfer between display unit and PCB holder is made through a CAN interface.
In its standard version, measuring instrument MG3 Digital is equipped with a 2-channel current-measuring and voltage-measuring card with appropriate internal periphery in a portable housing.
A combined path-, force-, and temperature-measuring card can supplement the standard version. Please contact our sales department for further details.
After applying mains, the measuring instrument MG3 Digital detects existing plug-in cards by plug & plays and configures itself automatically during the boot process.
Individual operator configurations remain stored even when the instrument has been switched off.

The values of the last 2.500 welds are stored temporarily in a battery-buffered memory module. If this memory is full the complete measurement data packet is written onto the compact flash card as log file.
In the standard version, parameters prepared for one measurement from 99 welding-control programs can be monitored via a program number interface. Miyachi Europe GmbH multiple program controls, too, are equipped with the corresponding interface.
Output of the selected parameters of each welding to a commercially available is possible. For that purpose, connect the printer to connector X51 (RS232 interface). In the printer menu, set the printer format to numeric for all measurements.
Operation of the instrument through a knob/push button combination.

2.2 Technical Data

Instrument type	MG3 Digital Digital measuring and monitoring instrument for resistance-welding installations
Program monitoring	99 programs, internal or external program selection, extensible
Measuring functions	AC and DC, effective (r.m.s.) current value, peak value of current, charge (I x t) and further effective voltage value, peak value of voltage, voltage integral (u x t) and further power in variances, energy resistance in variances, weld time (ms)
Counter	Up- and down-counter with prewarning and final value signal output
Measuring range current	**Coil x 1:** 2–5–20–100–500 kA peak value **Coil x 10:** 0.2–0.5–2–10–50 kA peak value
Measuring range voltage	0.5–2.5–10–50 V peak value
Measurement accuracy	± 1.5 % of upper limit of effective range for current and voltage
Minimum measurable current I_s	± 3 % for power. 10 % from measuring range, (for lesser currents special toroid coil 10-fold)
Maximum measurable current time	Approx. 2000 ms at DC, approx. 5000 ms at AC
Minimum measurable current time	Approx. 1 ms
Sampling rate	(V, I) = 100 kHz per channel, simultaneous sampling V, I of each channel
Graphic Resolution **Current / Voltage** **Pressure / Force** **Distance**	 measure time <= 50 msec: resolution 40 points per msec measure time > 50 msec: resolution 5 points per msec Pressure/Force 10 points/ms Digital distance 5 points/ms
Measuring interval	Variable Note The more graphics are displayed, data through RS232 and limit value and envelope curves are monitored, the longer the measuring interval.
Flattest permissible current rise	di/dt ≥ 2 A/ms at measuring range 2 kA. In the higher measuring ranges correspondingly more
Limit value setting	Independently from each other for the upper and lower limit value across the entire measuring range

Prewarning setting	Independently from each other for the upper and lower prewarning value across the entire measuring range
Graphic display	QVGA, 320 x 240 pixel
Optical display	8-fold via front LED
Outputs	Analog output for current on current-measuring card Further control outputs see terminal diagram
Inputs	2-fold current and voltage channel, program selection, CAN, RS232. Further control inputs see terminal diagram
Mains voltage and frequency	90-260 Volt, ± 10 %, 50-60 Hz, switching power supply
Power consumption	60 W
Ambient temperature	0 °C to 40 °C
Relative humidity	max. 70%
Dimensions	½ 19“: (WxHxD) 280 x 140 x 340 mm (Opt. 19”, 3HU)
Weight	ca. 5.3 kg, (approx. 11.7 lbs)

2.3 Maximum Cycle and Memory Times

Conditions:

1000 measurements each time with consistent time, voltage, current. No limit value, pre-warning or overrun outputs should be activated.

Validity:

Program versions
Display V1.2.7
PPC V1.119
DSP V1.4

Information:

These specifications only apply to signal-channel measurements. The recorded cycle time is doubled for parallel measurement.
Printing via the RS232 is deactivated.
The counter is activated.
2 x pre-warning and limit values are monitored.
Trigger = 1.5%, Filter = off, Envelope waveform = off.

Maximum cycle:

The maximum cycle is the largest possible number of complete welding sequences in a minute.
The table illustrates the cycle time (above) in ms and the maximum cycles per minute (below).

Maximum cycle for AC current
All specifications for **active** ready-output-inquiries.

Current display	AC current in [periods] 50Hz				
Measuring time	1 per.	2 per.	6 per.	13 per.	25 per.
Quadrant 1-4 numerical Logging = on	125 ms 480	140 ms 428	230 ms 260	360 ms 166	600 ms 100
Quadrant 1-4 numerical Logging = off	120 ms 500	140 ms 428	230 ms 260	360 ms 166	600 ms 100
Quadrant 1-4 graphical I(1),U(2),P(3),W(4) Logging = off	1630 ms 36	1670 ms 35	1750 ms 34	1910 ms 31	2190 ms 27
34Quadrant 1-4 SPC chart Logging = off	210 ms 285	220 ms 272	230 ms 260	340 ms 176	590 ms 101
Analysis window Logging = on	200 ms 300	220 ms 272	260 ms 230	420 ms 142	630 ms 95
Logging window Logging = on Last	300 ms 200	380 ms 157	440 ms 136	500 ms 120	680 ms 88
Logging window Logging = on All	390 ms 153	430 ms 139	470 ms 127	500 ms 120	650 ms 92
Graphic display (waveform I) Logging = on	550 ms 109	610 ms 98	640 ms 93	790 ms 75	1100 ms 54
Graphic display (waveforms I/U/P/W) Logging = on	1580 ms 37	1650 ms 36	1690 ms 35	1840 ms 32	2140 ms 28

Tbl. 1: Maximum cycle for AC – active

Maximum cycle for DC current
All specifications for **active** ready-output-inquiries.

Current display	DC current in [ms]				
Measuring time	23 ms	50 ms	100 ms	250 ms	500 ms
Quadrant 1-4 numerical Logging = on	130 ms 461	170 ms 352	190 ms 315	340 ms 176	602 ms 99
Quadrant 1-4 numerical Logging = off	126 ms 476	170 ms 352	190 ms 315	340 ms 176	602 ms 99
Quadrant 1-4 graphical I(1),U(2),P(3),W(4) Logging = off	1635 ms 36	1672 ms 35	1710 ms 34	1870 ms 32	2170 ms 27
Quadrant 1-4 SPC chart Logging = off	130 ms 461	180 ms 333	210 ms 285	350 ms 171	620 ms 96
Analysis window Logging = on	220 ms 272	240 ms 250	280 ms 214	400 ms 150	630 ms 95
Logging window Logging = on Last	250 ms 240	340 ms 176	380 ms 157	490 ms 122	680 ms 88
Logging window Logging = on All	390 ms 153	420 ms 142	470 ms 127	500 ms 120	660 ms 90
Graphic display (waveform I) Logging = on	550 ms 109	610 ms 98	640 ms 93	790 ms 75	1100 ms 54
Graphic display (waveforms I/U/P/W) Logging = on	1580ms 37	1650ms 36	1690ms 35	1840ms 32	2140ms 28

Tbl. 2: Maximum cycle for DC - active

Maximum cycle for AC current
All specifications **without** active ready-output-inquiries.

Current display	AC current in [periods] 50Hz				
Measuring time	1 per.	2 per.	6 per.	13 per.	25 per.
Quadrant 1-4 numerical Logging = on	140 ms 428	154 ms 398	253 ms 237	396 ms 151	660 ms 91
Quadrant 1-4 numerical Logging = off	132 ms 454	154 ms 398	253 ms 237	396 ms 151	660 ms 91
Quadrant 1-4 graphical I(1),U(2),P(3),W(4) Logging = off	1793 ms 33	1837 ms 32	1925 ms 31	2101 ms 28	2409 ms 24
Quadrant 1-4 SPC chart Logging = off	221 ms 271	242 ms 247	253 ms 237	374 ms 160	649 ms 92
Analysis window Logging = on	220 ms 272	242 ms 247	286 ms 209	462 ms 129	693 ms 86
Logging window Logging = on Last	330 ms 181	418 ms 143	484 ms 123	550 ms 109	748 ms 80
Logging window Logging = on All	429 ms 139	473 ms 126	517 ms 116	550 ms 109	715 ms 83
Graphic display (waveform I) Logging = on	605ms 99	671ms 89	704ms 85	869ms 69	1210ms 49
Graphic display (waveforms I/U/P/W) Logging = on	1738ms 34	1815ms 33	1859ms 32	2024ms 29	2354ms 25

Tbl. 3: Maximum cycle of AC - without

Maximum cycle for DC current
All specifications **without** active ready-output-inquiries.

Current display	DC current in [ms]				
Measuring time	23 ms	50 ms	100 ms	250 ms	500 ms
Quadrant 1-4 numerical Logging = on	143 ms 419	187 ms 320	209 ms 287	374 ms 160	662 ms 90
Quadrant 1-4 numerical Logging = off	138 ms 434	187 ms 320	209 ms 287	374 ms 160	662 ms 90
Quadrant 1-4 graphical I(1),U(2),P(3),W(4) Logging = off	1799 ms 33	1839 ms 32	1881 ms 31	2057 ms 29	2387 ms 25
Quadrant 1-4 SPC chart Logging = off	143 ms 419	198 ms 303	231 ms 259	385 ms 155	682 ms 87
Analysis window Logging = on	242 ms 247	264 ms 227	308 ms 194	440 ms 136	693 ms 86
Logging window Logging = on Last	275 ms 218	374 ms 160	418 ms 143	539 ms 111	748 ms 80
Logging window Logging = on All	429 ms 139	462 ms 129	517 ms 116	550 ms 109	726 ms 82
Graphic display (waveform I) Logging = on	605 ms 99	671 ms 89	704 ms 85	869 ms 69	1210 ms 49
Graphic display (waveforms I/U/P/W) Logging = on	1738 ms 34	1815 ms 33	1859 ms 32	2024 ms 29	2354 ms 25

Tbl. 4: Maximum cycle of DC - without

Logging memory times:
Saving on a CompactFlash card with full buffer, approx. 2500 numerical measuring values, duration approx. 50 s with empty CompactFlash card.
Saving on MicroDrive with full buffer, approx. 2500 numerical measuring values, duration approx. 50 s.

Program selection loading times:

Internal selection:
Quadrant 1-4 graphical I(1),U(2),P(3),W(4) duration approx. 3000 ms.
Quadrant 1-4 numerical duration approx. 600 ms.

External selection:

	Quadrant 1-4 numerical	**Quadrant 1-4 graphical I(1),U(2),P(3),W(4)**
Main image renewal = on	approx. 600 ms	approx. 3000 ms
Main image renewal = off	approx. 50 ms	approx. 50 ms

3 Commissioning

Measuring instrument MG3 Digital is supplied with a fixed stirrup for setting up the equipment.
The tilt angle of the measuring instrument front panel can be adjusted by means the stirrup for taking a non-dazzling reading of the screen.

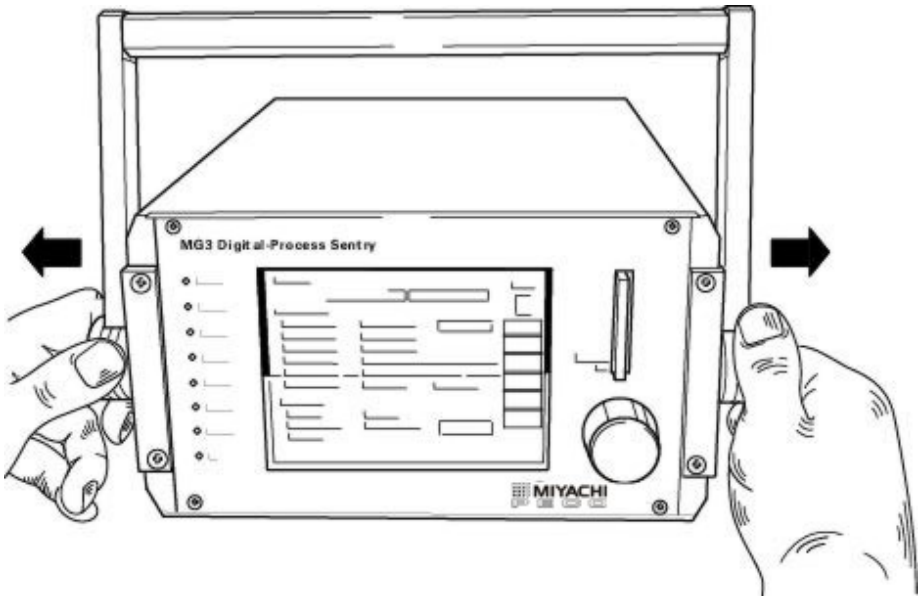


Fig. 1: MG3Digital with stirrup

Remove measuring instrument MG3 Digital from the packing and set it up at the designated place.
Pull apart both caps at the stirrup's pivot points (Fig. 1).
Adjust desired position.

3.1 Connecting the Components

3.1.1 Description of the Connectors

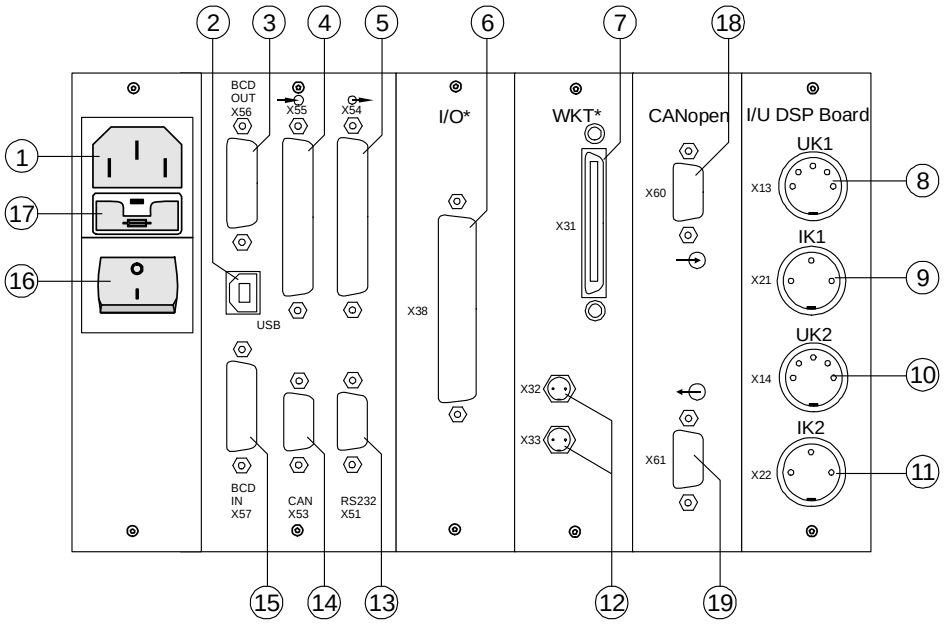


Fig. 2: Connectors on the housing rear side

* optional plug-ins

No.	Connector	Function
1	**Mains**	Rubber connector for mains cable. Check **mains voltage** on type **designation plate**.
2	**USB**	No usage
3	**X56**	Outputs for program number (set BCD or binary code accordingly, 1...99 with a standard device) See enclosures: Connection diagram 767.00590
4	**X55**	Control inputs from peripheral equipment
5	**X54**	Control outputs to peripheral equipment
6	**X38 (opt.)**	Inputs and outputs extended I/O
7	**X31 (opt.)**	Connecting terminal for position-encoding system (2-fold) and force-sensing device
8	**X13 UK1**	Input channel 1 for voltage measurement
9	**X21 IK1**	Input channel 1 for current measurement
10	**X14 UK2**	Input channel 2 for voltage measurement
11	**X22 IK2**	Input channel 2 for current measurement
12	**X32 X33**	No usage
13	**X51**	RS232 interface (e.g. to serial printer or PC)
14	**X53**	No usage
15	**X57**	Outputs for program number (set BCD or binary code accordingly, 1...99 with a standard device) See enclosures: Connection diagram 767.00590
16		ON-OFF switch for mains voltage
17		Miniature fuses
18	**X60**	CANopen IN
19	**X61**	CANopen OUT

3.1.2 Connector Pin Assignment of Inputs & Outputs



The outputs always represent the last measurement. They will be set or cleared only after a new measurement.

3.1.2.1 Connector X54 (Outputs)

Pin	Name	Channel	Function
1	Ready	1 and 2	Control unit ready and can receive data. Ready flag skipped during counter or measured value reset, during boot procedure, or by HIGH signal at control input NOT READY, measurement reset, data transfer
2	Current	1	Signal waiting until manually set measuring time ends after acquired current input or as long as an active current signal lasts that is registered in the course of the measuring time.
3	WARN min.	1 and 2	Output of prewarning monitoring minimum.
4	WARN max.	1 and 2	Output of prewarning (WARN) monitoring maximum.
5	Limit value min.	1 and 2	Output of limit value monitoring minimum.
6	Counter limit	1 and 2	Signal waiting when counter final value is reached till counter reset.
7	REJECT	2	Signal waiting as soon as monitored parameter is outside of limit value tolerance.
8	Current	2	Signal waiting until manually set measuring time ends after acquired current input or as long as an active current signal lasts that is registered in the course of the measuring time.
14	ACCEPT	1	Signal waiting as long as parameters monitored with limit values are within limit value tolerance.
15	REJECT	1	Signal waiting as soon as monitored parameter is outside of limit value tolerance.
16	Overflow	1 and 2	Signal waiting if a set measuring range is exceeded by the measured parameter.
17	Zero current	1	Signal is activated: a) after external trigger signal if no current is measured during this. b) after part detection subsequent to interrupted part evaluation (valid part detection). c) if trigger source “0 penetration“ or “Force trigger“ is activated and no current is measured. Signal is deactivated: a) at beginning of measurement b) with signal at measuring value reset input
18	Limit value max.	1 and 2	Output of limit value monitoring maximum.
19	Counter WARN	1 and 2	Signal waiting when counter reached prewarning value till counter reset.
20	ACCEPT	2	Signal waiting as long as parameters monitored with limit values are within limit value tolerance.
21	Zero current	2	Signal is activated: a) after external trigger signal if no current is measured during this. b) after part detection subsequent to interrupted part evaluation (valid part detection). c) if trigger source “0 penetration“ or “Force trigger“ is activated and no current is measured. Signal is deactivated: a) at beginning of measurement b) with signal at measuring value reset input

3.1.2.2 Connector X55 (Inputs)

Pin	Name	Channel	Function
5	Clear ACCEPT outputs, set faults	1 and 2	This signal disables all ACCEPT outputs; all limit, REJECT, and prewarning (WARN) outputs (fault outputs) are set.
8	Save log-file	2	
9	Counter reset	1	A signal sets counter to its initial value.
10	Measurement reset and outputs cleared	2	Displayed measured values are set to zero with falling edge and outputs are cleared.
12	Hold	1	No arriving measured values of a succeeding welding are accepted after a signal. If Hold signal is dropped again, the measured values are read in again starting with a new welding.
13	Trigger	1	Parameter values received after signal are acquired but evaluated and transferred only after trigger signal has become LOW again with falling edge. Acquired parameter values during continuously waiting trigger signal are overwritten by newly arriving measurements without evaluation and transfer.
17	Not ready	1 and 2	A signal disables parameter value acquisition; ready output at X54, pin 1 goes to LOW.
18	Set ACCEPT outputs, clear faults	1 and 2	This signal disables all REJECT and limit value outputs; all ACCEPT outputs are set.
21	Save log-file	1	
22	Counter reset	2	A signal sets counter to its initial value.
23	Measurement reset and outputs cleared.	1	Displayed measured values are set to zero with falling edge and outputs are cleared.
24	Hold	2	No arriving measured values of a succeeding welding are accepted after a signal. If Hold signal is dropped again, the measured values are read in again starting with a new welding.
25	Trigger	2	Parameter values received after signal are acquired but evaluated and transferred only after trigger signal has become LOW again with falling edge. Acquired parameter values during continuously waiting trigger signal are overwritten by newly arriving measurements without evaluation and transfer.

3.1.2.3 Connector X38 (I/O Outputs)

Pin	Name	Chann.	Function
3	Sinking Path min.	1	Depending on setup default; becomes active if the currently measured sinking path min./max. is exceeded or remains under
4	Sinking Path max.	1	
5	Sinking Path min.	2	see above
6	Sinking Path max.	2	
7	Prewarn Dist. S3	1	
8	Prewarn Dist. S6	2	
9	Sinking 2 Accept 2	2	Output enabled if sinking path 2 is ACCEPT
10	Sinking 1 Accept 1	1	Output enabled if sinking path 1 is ACCEPT
11	Pressure/Force reject	1	
12	Pressure/Force accept	1	
13	Pressure/Force reject	2	
14	Pressure/Force accept	2	
17	Path Abort current High	2	Output active on High; is enabled if cutoff value is exceeded.
31	Path Abort current Low	2	Output active on Low; is enabled if cutoff value is exceeded.
18, 21	Plus terminal (+)		Common plus terminal (+) for PIN: 14, 13, 11, 12, 10, 9, 8, 7, 6, 5, 4, 3, 30, 29, 28, 27, 26, 25, 24, 23
19	Common (+) 1	1	Common plus terminal 10 – 30 V for PIN 16 and 20.
20	Path Abort Current High	1	Output active on High; is enabled if cutoff value is exceeded.
16	Path Abort Current Low	1	Output active on Low; is enabled if cutoff value is exceeded.
25	Parts Detection Low active	1	if limit values are not reached or exceeded, then this output is switched off (pressure switch control unit),
26	Parts Detection Low active 2	2	if limit values are not reached or exceeded, then this output is switched off (pressure switch control unit),
27	Path Parts Detection min.	1	Depending on setup default; becomes active if the currently measured parts control path min./max. is exceeded or remains under.
28	Path Parts Detection max.	1	
29	Path Parts Detection min.	2	Depending on setup default; becomes active if the currently measured parts detection path min./max. is exceeded or remains under.
30	Path Parts Detection max.	2	
34	Common (+)	2	Common plus terminal 10 – 30 V for PIN 17 and 34.

3.1.2.4 Connector X38 (I/O Inputs)

Pin	Name	Function
22	Ground connection	Common connection of the inputs.
35	n/c	
36	n/c	
37	n/c	
38	n/c	
39	Reference run part detection 1 and 2	if this input is active, the reference value is determined on the next parts detection run without inserted component Adjustment: Path-measuring mode to reference
41	n/c	
42	n/c	
43	n/c	
44	n/c	
45	Null Sinking 2	Setting = Null Sinking 2 with rising slope, zeroing with rising slope, cooling time with dropping slope.
46	Null Sinking 1	Setting = Null Sinking 1 with rising slope, zeroing with rising slope, cooling time with dropping slope.
47	Parts Detection 2	Setting to parts detection = HWScan. Measured value evaluated and part set to min. 2 – max. 2.
48	Parts Detection 1	Setting to parts detection = HWScan. Measured value evaluated and part set to min. 1 – max. 1.
49	Start Measure 2	Part detection 2 for sensor 1 started.
50	Start Measure 1	Part detection 1 for sensor 1 started.

3.1.2.5 Connector X51 (RS232) / Baud rate

Pin	Name
1	free
2	TxD
3	RxD
4	5V
5	GND
6	free
7	CTS
8	RTS
9	free

Baud rates (bit/s)	9600; 19200; 38400; 57600; 115200
Data bits	8
Start bits	1
Stop bits	1
Parity	none
Busy Control	no/off

3.1.2.6 Connector X60 and X61 (CANopen)

Connection with standard RS232-extension cable (1:1)

Pin	Name	Function
1	Free	
2	CAN_L	Low-level
3	CAN_GND	Ground
4	Free	
5	CAN_SHLD	Circuit shield
6	Free	
7	CAN_H	High-level
8		
9		

CAN-Baud rates	1MB/s 800 kB/s 500 kB/s 250 kB/s 125 kB/s 50 kB/s 20 kB/s 10 kB/s

3.1.3 Establishing Connections for Voltage Measurement

If no threaded holes are provided for attaching the voltage measuring cables you may make them yourselves.
Take care to position the threaded holes as close to the electrodes as possible without compromising their stability!

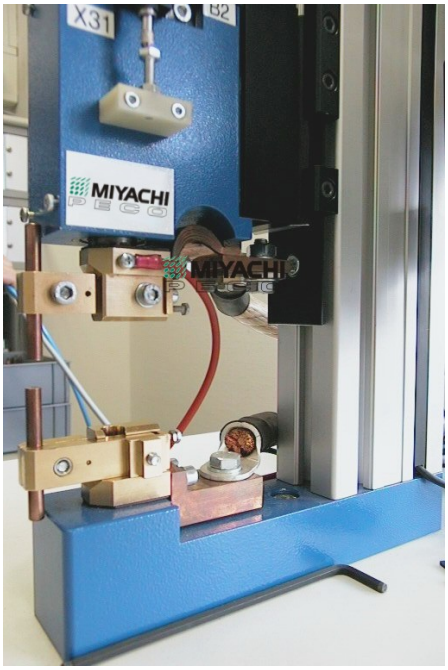


Fig. 3: (+) Connection (example)

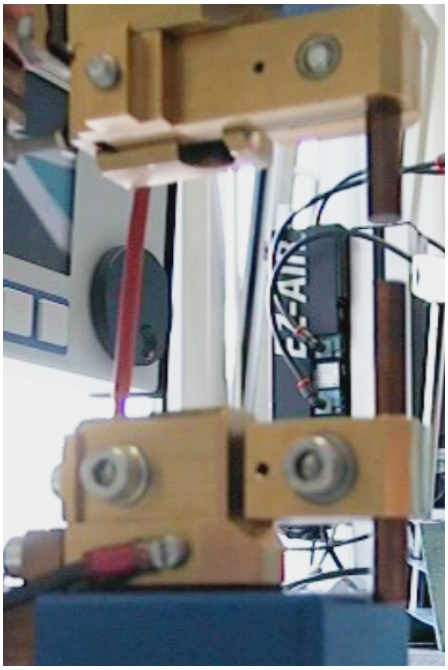


Fig. 4: (-) Connection (example)

- Connect the red cable (+) terminal to the welding head (+) pole (Fig. 3) at the position provided for this purpose.
- Connect the black cable (–) terminal to the welding head (-) pole (Fig. 4) at the position provided for this purpose.
- Insert the 5-pole male connector in socket X13 (Fig. 2/8) or X14 (Fig. 2/10).

3.1.4 Establishing Connections for Displacement Measuring

Coils of various types for current measurement are provided.
The coil amplification factor is of particular importance. Please take the amplification factor (1:1 or 1:10) from the type designation plate of the coil purchased by you or the technical data of the coil (see separate data sheet).
There are two examples for coils in Fig.5 and Fig. 6.



Fig. 5: Flap toroid coil (example) with (+) side marking



Fig. 6: Toroid coil (example) with (+) side marking

Direction of current, and therefore, coil installation direction is important in order to ensure correct current reading.
Ensure that the correct coil fitting position is selected during installation!

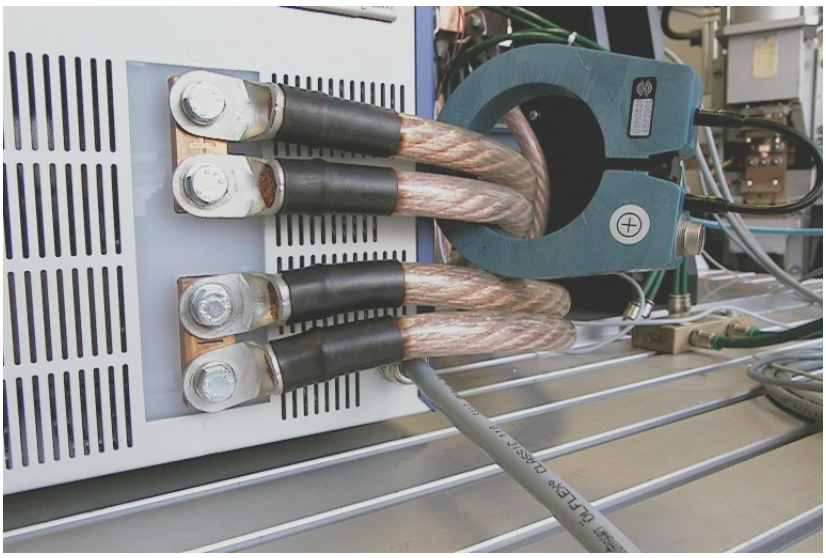


Fig. 7: Application example with a built-in flap toroid coil

- Install the flap toroid coil or toroid coil in the (+) line of the current source (Fig. 7). Ensure that the (+) side of the coil show points in the direction of the current source (+) terminal.
- Connect the cable for current measurement to the flap toroid coil or toroid coil.
- Insert the 3-pole male connector in socket X21 (Fig. 2/9) or X22 (Fig. 2/11).

3.1.5 Establishing Connections for Displacement Measurement

The displacement measurement is optional.

ⓘ	The displacement measuring system should be disconnected from the welding head to ensure that the measuring result is correct. Ensure that the displacement measuring system is attached to the welding head with a non-conductive material (e.g. polyamide)!



Fig. 8: Built-on, disconnected displacement measuring system

- Attach the displacement measuring system to the welding head using non-conductive material (Fig. 8).
- Connect the displacement measuring system to the supplied adapter.
- Connect the adapter to socket X31 (Fig. 2/7).

3.2 Initial Commissioning

3.2.1 Preconditions

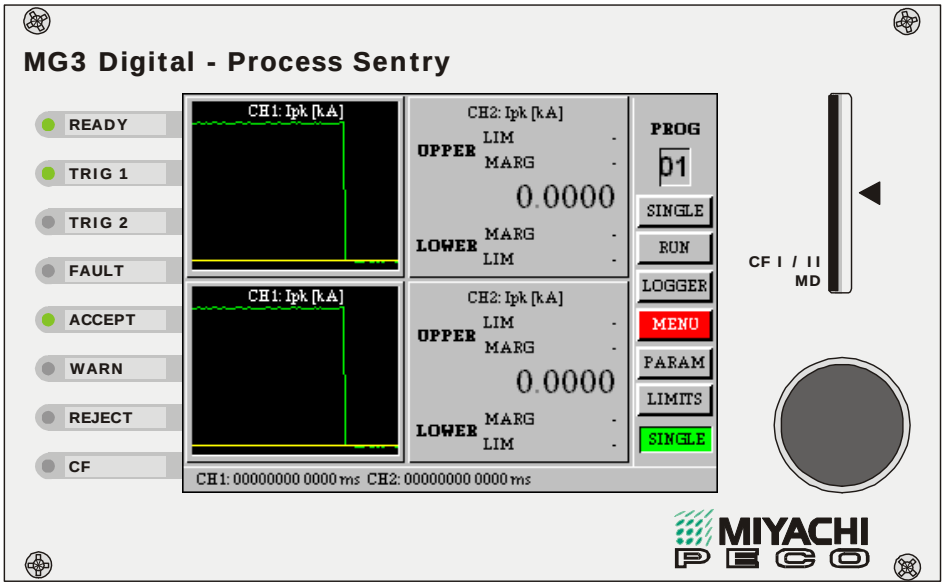


Fig. 9: MG3 Digital – Front view

- Check to see that measuring instrument MG3 Digital is switched off. The main switch must be in position 0.
  See section 3.1.1, Fig. 2/16.
- Check mains voltage and frequency at place of installation. See section 2.2.
- Plug in power supply cord to the inlet socket for non-heating appliances at the rear of measuring instrument MG3 Digital. See section 3.1.1, Fig. 2/1.
- Check to see whether the CompactFlash™-card (CF card) is plugged in. Plug in the CF card into the slot() provided for that on the front panel.

3.2.2 Starting-up

Switch on the main switch on the rear side of measuring instrument MG3 Digital. See section 3.1.1, Fig. 2/16.
After initialization, lasting for approx. 30 seconds, you can configure measuring instrument MG3 Digital.

If the equipment is switched off while booting, it will start up in a safe mode skipping initializations on being switched on. This may cause characters to be represented wrongly or not at all. Start up the equipment a second time in this case.

4 Operation

4.1 Measuring Instrument MG3D – What is What?

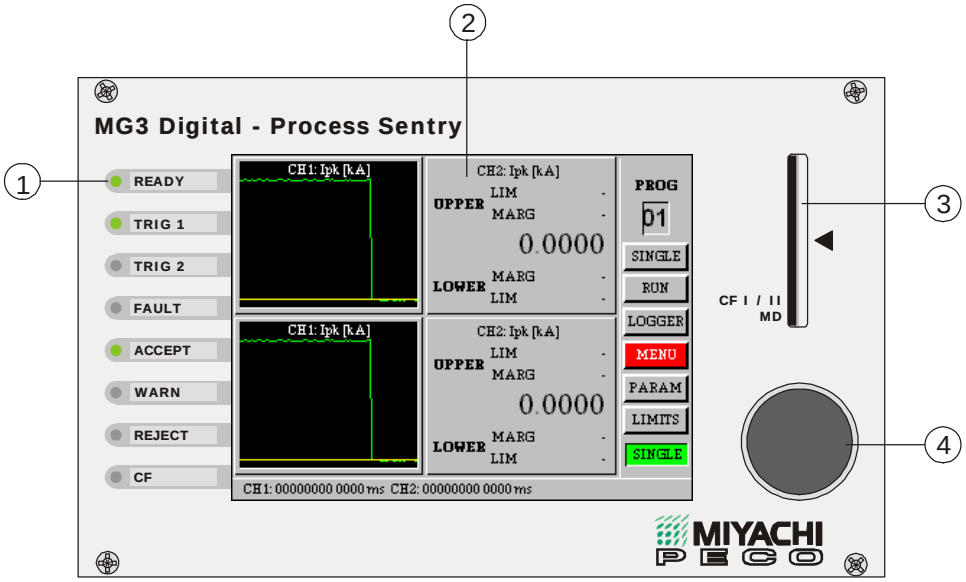


Fig. 10: Control panel MG3 Digital

1. LED status displays
2. Screen (display)
3. Board slot for the CompactFlash (CF) card(s) type I or II, or for a MicroDrive (MD)
4. Knob/pushbutton combination

4.1.1 LED Status Displays

LED Status Displays signalize:

- Measuring instrument MG3 Digital ready for measurement (READY)
- Measurement activity on channel 1 or 2 (TRIG1, TRIG2)
- Measuring instrument MG3 Digital overflow metering range (FAULT)
- Measurement within set limit values (ACCEPT)
- Measurement outside set warning limit(s) (WARN)
- Measurement outside set limits (REJECT)
- Compact flash card missing (CF flashes) or access to compact flash card (CF lights)

4.1.2 Screen (Display)

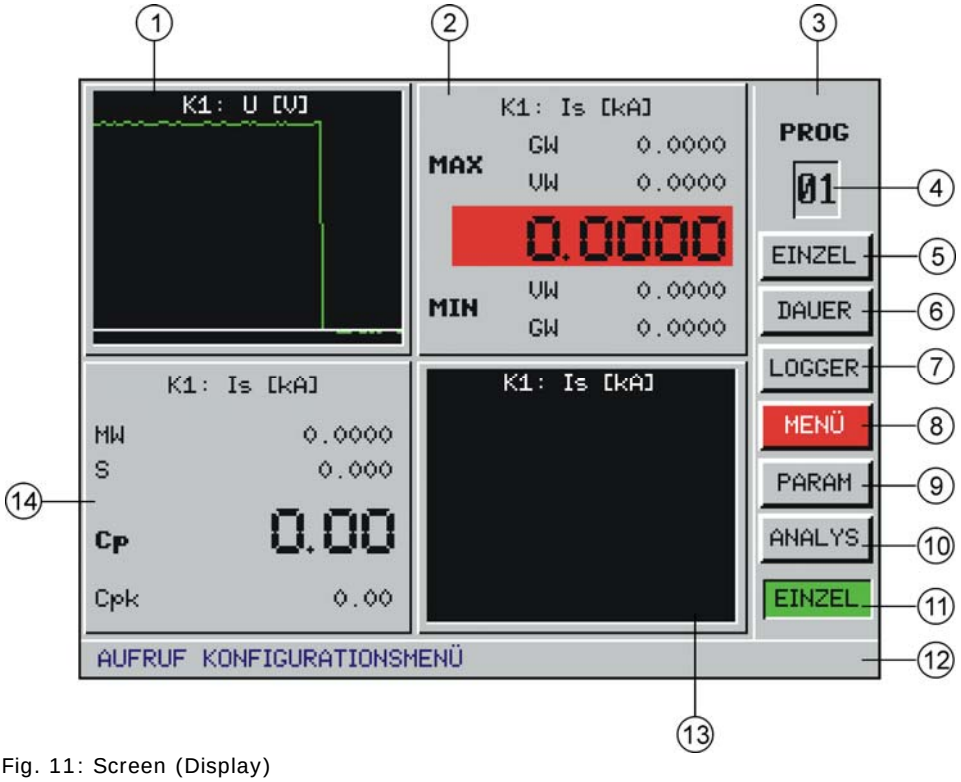


Fig. 11: Screen (Display)

1. Display window quadrant 1 (Q1)
2. Display window quadrant 2 (Q2)
3. Menu bar
4. Program number selection
5. Button “Single measurement ON” (SINGLE)
6. Button “permanent measurement” (RUN)
7. Button “to logging” (LOGGER)
8. Button to “configuration menu” (MENU)
9. Button to “parameter overview” (PARAM)
10. Button “to analysis” (LIMITS)
11. Display current meas. mode (SINGLE)
12. Status bar for status, help, and fault messages
13. Display window quadrant 4 (Q4)
14. Display window quadrant 3 (Q3)

4.1.2.1 Display Windows – Quadrant 1 to 4

Representation of the measured values in four, freely configurable display windows (quadrants).
Any display window can be run in one of the following display modes:

- numeric
- graphical
- SPC*-Chart
- SPC*-Values

* SPC: Statistical Process Control

Selection of any quadrant by rotating the knob/pushbutton combination.
Depressing the knob/pushbutton combination offers a magnified and more detailed view of the quadrant with additional setting possibilities. Depressing the main display field once more goes back to the previous display.
Numeric display specific feature
After a measurement, the measured value of the numeric display can flash colored or gray.
This means in this case:

- yellow: the current set pre-warning value is not reached or exceeded
- red: the current set limit value is not reached or exceeded
- grey: measurement was invalid (range overflow)

4.1.2.2 Menu Bar

The menu bar comprises the:

- Readout/setting of the current program number (1…99)
- Display of the current measuring mode (SINGLE/CONT.)
- Switches for selecting displays and measuring mode

4.1.2.3 Program Display

The program displays informs you about the number of the currently running measuring program. The indicating range is 1 to 99.
Program selection through the knob/pushbutton combination.

4.1.2.4 Measuring Mode

Here you can read the measuring mode that the measuring instrument is running right now.
You can select two measuring modes through the knob/pushbutton combination:

- Single measurement (SINGLE) or
- Continuous measurement (CONT.)

4.1.2.5 Status Bar

Depending on the control elements selected, the status bar shows you:

- Information on the last measurement (channel 1/2)
- Details on the meaning of the control elements selected
- Information on the condition of the function selected
- Fault messages

4.1.3 Board Slot for Compact Flash Card or MicroDrive

You can either insert a CompactFlash™ card or a MicroDrive™ into the slot for compact flash (CF) card(s) type I or II or for a MicroDrive (MD).

	Only use CompactFlash-Cards supporting IDE-standard tested from our company. You can get these tested cards from us.
Caution	**Loss of data!** Before pulling out the compact flash card or MicroDrive from the notebook or PC you will need to disable them on the software side. Only insert the compact flash card or MicroDrive into the slot of measuring instrument MG3 Digital when the equipment is switched off.

4.1.4 Knob / pushbutton Combination

The knob/pushbutton combination is the central operating element of measuring instrument MG3 Digital.
You carry out all settings through the knob/pushbutton combination:

- A rotary movement selects the menu items. Depressing the knob/pushbutton combination enables the selected element (switch, selection field, quadrant, etc.).
- Grayed option points or parameters are disabled and cannot be selected.

Input fields are:

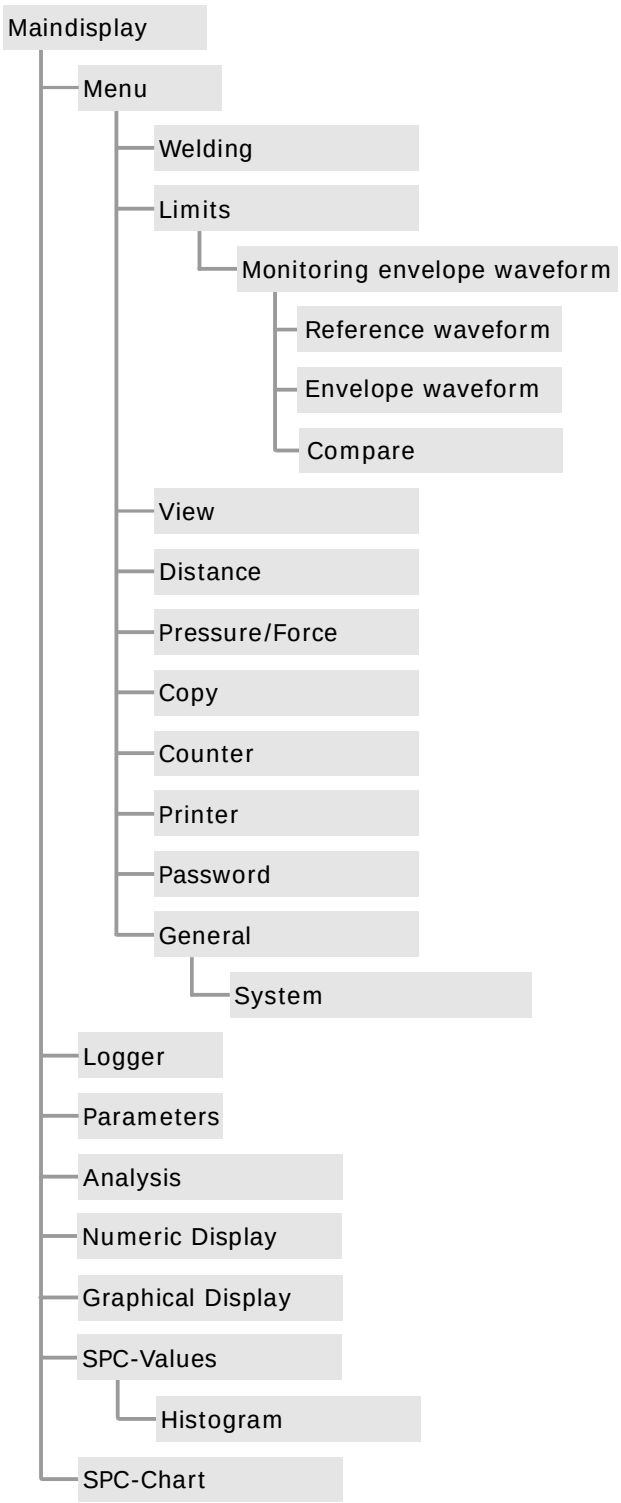
- Buttons that trigger a certain action when depressed
- Switches that have two switching conditions
- Selection fields that allow selection from a list of options
- Entry fields that allow entry of numbers. Pressing upon a button once transfers you to the quick-edit mode where you can change the whole number. Pressing twice takes you to the precision editing mode where you can change any individual digit.
- Pressing the knob/pushbutton combination once more takes you back to the entry field.

If the MG3 Digital, during booting, has detected that no WKT card was inserted, then only those parameters are offered that can be represented on account of current and voltage measurements.

4.1.5 UNDO Function

The menu bar offers the button UNDO for all windows where parameters can be set. As long as you are in this window, you may cancel the last 50 entries by that.

4.2 Menu Structure



Tbl. 5: Menu structure

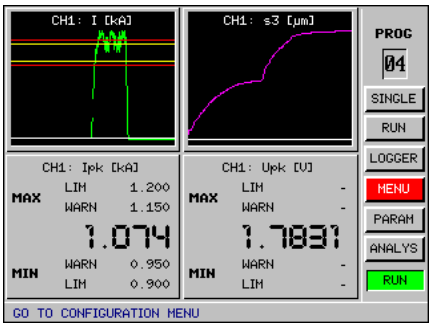
5 How to ...?

5.1 Carry out a General Set-up

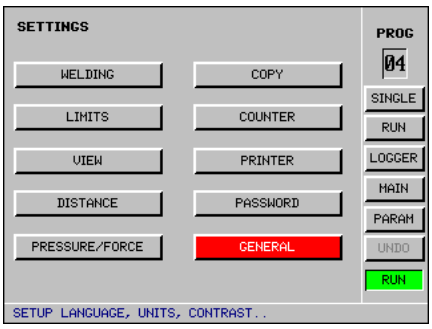
Current situation
After starting-up and initialization, measuring instrument MG3 Digital is in measuring mode Continuous Measurement.
First perform basic settings that form basis for everything else.

Procedure

- Check to see whether the MG3 Digital is in main menu.
- If the MG3 Digital is not in main menu, you will need to select button MAIN by means of the knob/pushbutton combination in the menu bar and press button.

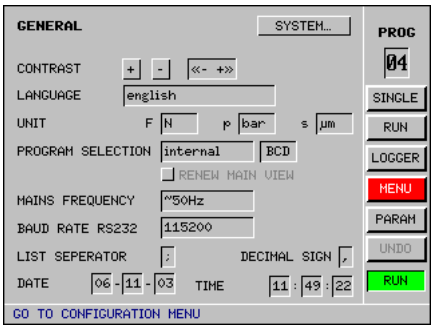


- Select button MENU with the knob/pushbutton combination and depress button.
- Screen **SETTINGS** opens.
- Select button GENERAL with the knob/pushbutton combination and depress button.



- Screen GENERAL opens.
  You have following setting options:

  Contrast
  Influences screen representation.
  Set contrast such that you achieve best possible reading result.



  LANGUAGE
  You can select the common languages on the display.

  UNIT
  Following units are ready for selection:
  - for force measurement F:
    N or **lbs**
  - for pressure measurement p:
    bar or **psi**
  - for path measurement s:
    µm or **th**“ (thousandth inch)

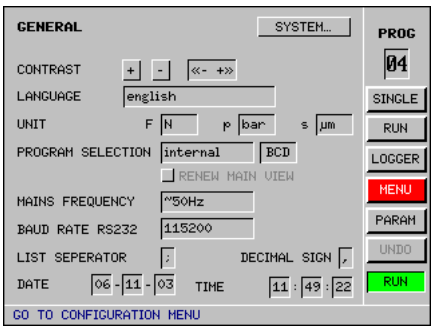
PROGRAM SELECTION
Here you can influence how measuring program selection shall happen. Either through the knob/pushbutton combination **internal** (standard) or **external** through the external hardware input at connector X57.
Setting for program in-/output as binary-coded decimal (BCD) or binary (BIN).

MAINS FREQUENCY
Here you select the mains frequency at your site. There is a choice of **~50 Hz** or **~60 Hz**.

Caution

Wrong settings will produce wrong measurements!

BAUD RATE RS232
Here you determine the transmission rate. It must correspond to the set rate of your PC/laptop serial interface.
You can set the transmission rate from **9600** Baud to **115200** Baud.



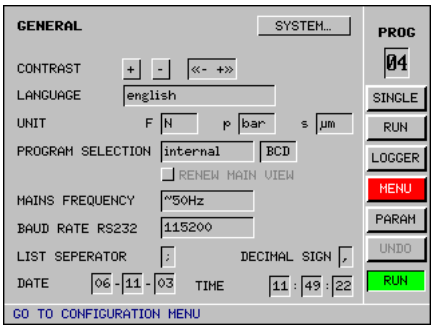
LIST SEPARATOR, DECIMAL SIGN
The MG3 Digital stores its data in a CSV* compatible data format.
For instance, to have Excel read this data, the sign for the last separator/decimal sign on the MG3 Digital and the sign for the last separator/decimal sign on your PC must check.

Note
If you are uncertain which signs you are using on your PC, check that by running through the **Settings button**, then double-click the **Regional Settings icon**, then Number tab, and there List separator.
There you can select between "**;**" or "**,**".
Select between "**,**" or "**.**" as decimal sign under Digit grouping symbol on the same tab.
* CSV = Comma Separated Value

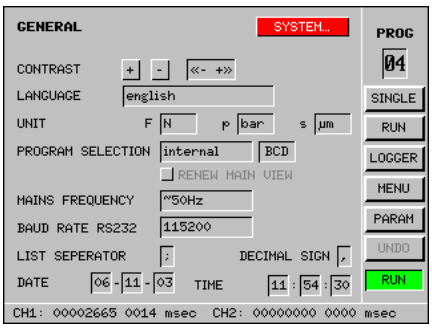
DATE
The date format is made up of the following:
MM-DD-YY
(month-day-year)

TIME
The time format is made up of the following:
HH:MM:SS
(hour:minute:second)

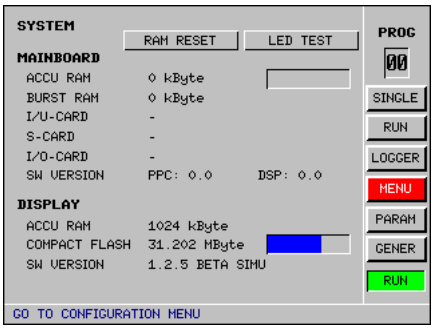
RENEW MAIN VIEW
This can prevent the necessity for renewed set-up of the main display window for each new selected program in the event of an external program selection. Set-up of the main display window takes time. It is also necessary for SPC when configuring quadrant windows, and to ensure that these quadrant windows are configured the same for each program, as the SPC card will otherwise be reset.
Deactivation of this option is therefore advantageous when rapidly switching programs and utilizing the SPC charts, as the main display need only be configured once.



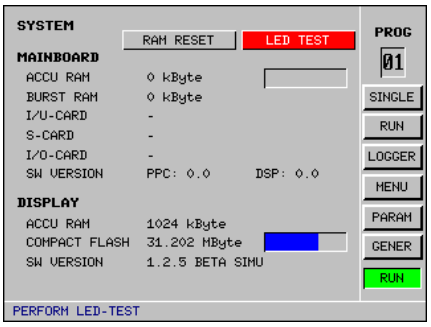
- Next, select button SYSTEM with the knob/pushbutton combination and depress button.



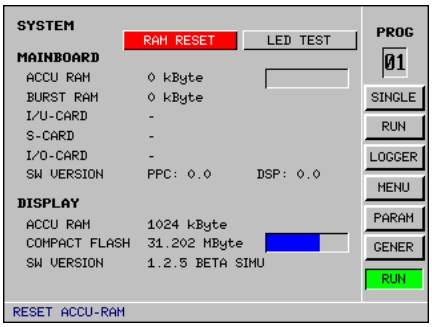
Screen **SYSTEM** opens.
This screen displays general system information.
Among others, about:
- the main board
  (RAM assignment, built-in plug-in cards, hardware version, software version PPC and DSP)
- the display
  (RAM assignment, compact flash card or MicroDrive memory capacity, display software version)



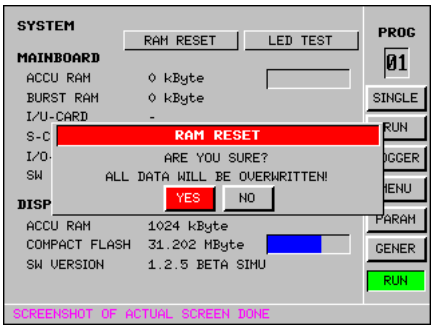
- Select button LED TEST with the knob/pushbutton combination and depress button.
- As function check, all LEDs on the equipment front panel light shortly.



- Select button RAM RESET with the knob/pushbutton combination and depress button.



- Screen **RAM RESET** opens, allowing you to reset RAM and MG3 Digital to its standard (original) values.
- Use **RAM RESET** only, if you have no other choice left. Before resetting, save your set parameters to the compact flash card.



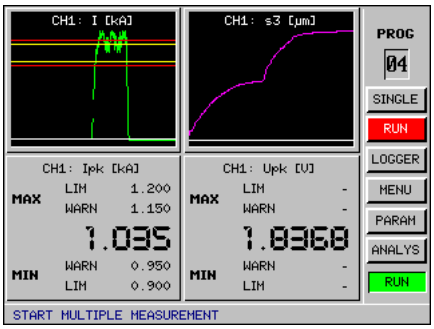
Caution

Loss of data!
If you perform RAM RESET, all set parameters will be lost!

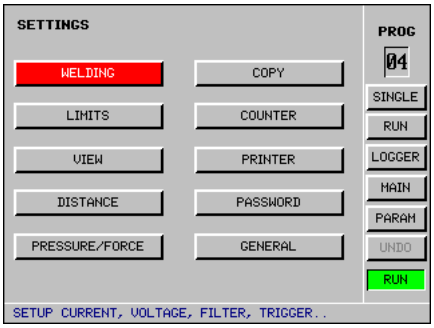
5.2 Measuring current and voltage

Procedure

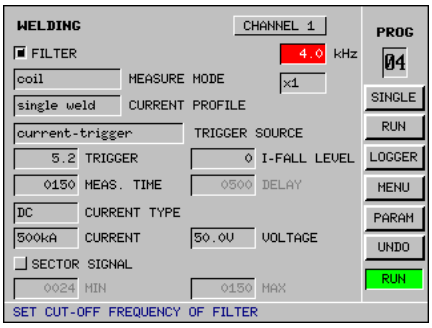
- Select button MENU with the knob/pushbutton combination and depress button.



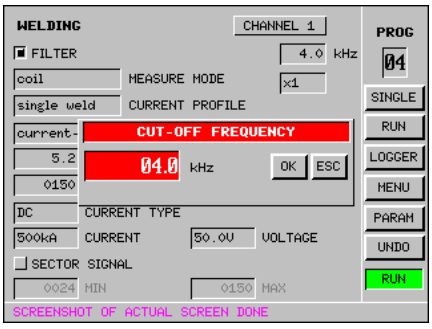
- Screen **SETTINGS** opens.
- Select button WELDING with the knob/pushbutton combination and depress button.



- Screen **WELDING** opens.
  You have following setting options:
  CHANNEL 1
  Here you can select the measuring channel 1 or 2) that needs to be configured.

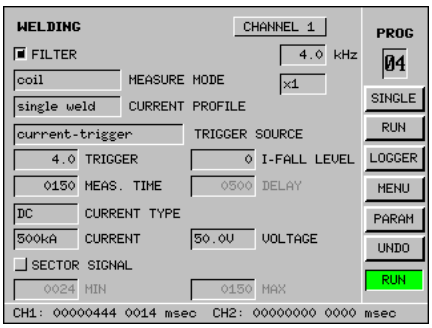


FILTER
For isolating disturbances, you can enable/disable a low-pass filter (frequency range 0.1…25 kHz). To enable this function, you need to select the box beside the word FILTER with the knob/pushbutton combination and check the box.
Recommended setting for inverter controller: 1/5 of inverter frequency.
1 kHz inverter → 200 Hz
20 kHz inverter → 4 kHz



MEASURE MODE
You can select between:
- **Coil** (standard) or
- **Shunt** (See section 5.3.)

In addition, you need to state the coil amplification factor (**x1, x10**). Please read the amplification factor from the coil label.

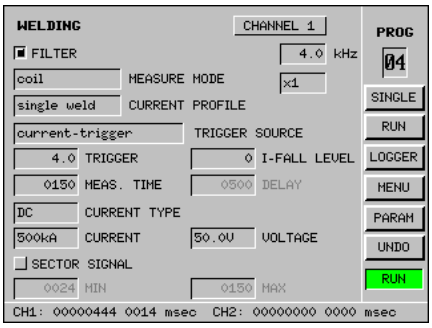


CURRENT PROFILE
Selection of the welding current profile.
You can select between:
- **Single weld** (standard) or
- **Seam** (option).

TRIGGER SOURCE
Measuring is started in the case of a **current trigger** by the set current range end value when the trigger is reached.
Measuring is started in the case of a **force trigger** by the set force/pressure range end value when the trigger is reached.
The trigger is actuated in the event of **0 displacement** if a signal is active at "Zero penetration 1 or 2" the hardware input (X38).

TRIGGER
The value in field TRIGGER determines the current / the force %-value that must be input in order to start the measuring process.
The range can be set between 0 to 100 related to the upper limit of the effective range.
Recommended setting: 4.0
At inverter < 1.0 %.

I-FALL LEVEL
Specifies the value of falling current in % of Is to which the on-time tw is counted.



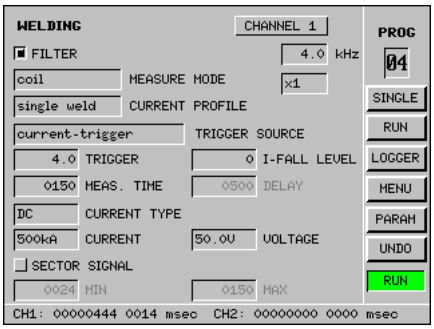
MEAS. TIME
For single weld measurement, you need to set a bigger value of the welding control total current time here.
Depending on current source connected, the total current time can also result from the total of single pulses and intervals.
Setting range
AC: 0 to 5000 ms
DC: 0 to 2000 ms

DELAY
Option

CURRENT TYPE
Set type of current of welding current source here.
DC for direct current sources
AC for alternating current sources

CURRENT / VOLTAGE

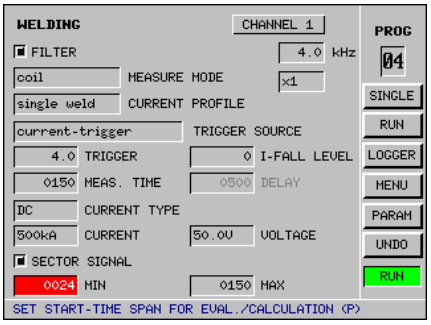
Set the measuring range end value best suited to your task here.
Measuring range end value for current:
2 kA–5 kA–20 kA–100 kA–500 kA
Measuring range end value for voltage:
0,5 V–2,5 V–10 V–50 V



Many modern welding current controls offer a current, voltage and power control option. Proceed as follows (depending on the selected control type) to achieve a correct measuring range end value:
For constant current control:
Set the next-greatest measuring range end value for the current (which suits the set current on the welding current source). Enter 50V for the voltage. Conduct a test measurement (welding operation). Set the measuring range end value for the voltage subsequently to the next-greatest value (which suits the measured voltage).
For constant voltage control:
Set the next-greatest measuring range end value for the voltage (which suits the set voltage on the welding current source). Enter 500kA for the current. Conduct a test measurement (welding operation). Set the measuring range end value for the current subsequently to the next-greatest value (which suits the measured current).
For constant power control:
Enter 500 kA for the current and 50 V for the voltage as the measuring range end value. Conduct a test measurement (welding operation). Set both measuring range end values subsequently to the next-greatest value (which suits the measured current and measured voltage).

SECTOR SIGNAL

Activation and the input of a MIN and MAX values allows you to determine a time slot in which measuring value monitoring should occur.



5.3 Conducting Measurements with “Shunt”

Principle of shunt measurement with the MG3Digital
The “shunt measurement” operating mode involves the measurement of a voltage drop relative to a shunt resistance which, in turn, is series connected relative to a welding position resistance.

Measurement inputs:		
U channel 2	=	shunt voltage (direct)
U channel 1	=	welding position voltage
I channel 1	=	not connected
I channel 2	=	not connected

Representation:		
Shunt current	I channel 1 (converted shunt voltage)	[kA]
Welding position voltage	U channel 1	[V]
Shunt voltage	U channel 2	[V]
I channel 2	empty	

The shunt resistance value must be set if the correct shunt current is to be obtained.
The device converts the shunt value into the equivalent current.
The lowest measurable shunt voltage is 50mV for a measuring range of 0.5V U channel 2.

Principle connection to a welding unit

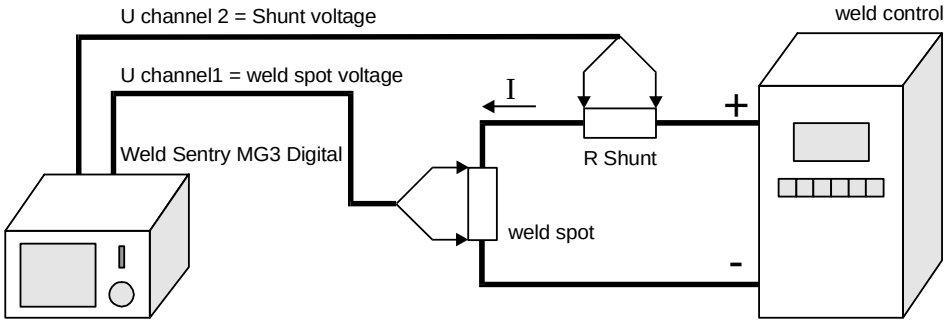


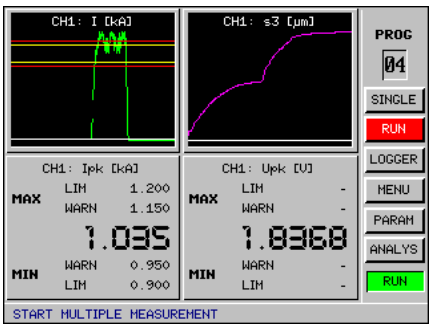
Fig. 12: Schematic connection scheme for special “shunt” operating mode

Equivalencies of parameters
Differently from normal measure mode „coil“ several menu points in measure mode „shunt“ are not active or are otherwise assigned.
Overview:
X = active menu point
- = inactive menu point

Menu item	Channel 1	Channel 2	Adjustable values
Filter	X welding position voltage	X shunt voltage	ON/OFF 0.1-25kHz
Measuring mode	X	-	Coil/Shunt
Current profile	-	X	Point/Seam (Option)
Trigger source	-	X	Current/Force trigger/ 0 penetration
Trigger	-	X	0-100% of measuring range end value
I fall value	X shunt current X	X shunt voltage	10-95% from peak value
Measuring time	-	X	1-2000(DC)/1-5000(AC)ms
Measuring pause	-	X	0-2000 ms
Current type	-	X	AC/DC
Current	X shunt current	-	2kA-500 kA
Voltage	X welding position voltage	X shunt voltage	0.5V-50 V
Sector signal	X welding position voltage	X shunt voltage	0 measuring time ms

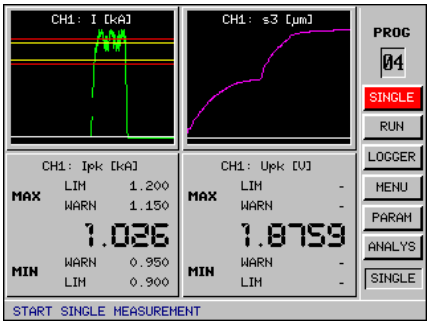
5.4 Changing Over Between Single and Continuous Measurement

Measuring instrument MG3 Digital is in continuous measurement mode on system start-up.
This is indicated through the green window lettered RUN.
This means that a measurement is performed and logged on any valid triggering.



Procedure

Select button SINGLE with the knob/pushbutton combination and depress button.
Measuring instrument MG3 Digital will change to the single measurement mode now.
This is indicated through the green window lettered SINGLE.



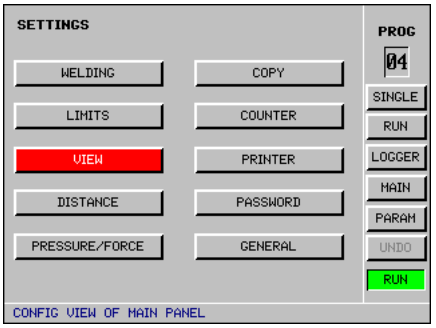


In **single measurement** mode, the equipment switches to hold after triggering. The display SINGLE is grayed. Readiness for measurement is only re-enabled after renewed pressure onto button SINGLE.
When in **continuous measurement**, readiness for measurement is always maintained.

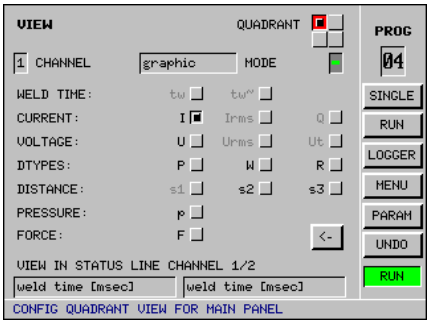
5.5 Configuring Display Window for the Various Types of Measurement Categories

Representation of the measured values in four, freely configurable display windows (quadrants).
Every display window can be operated in four different display modes.

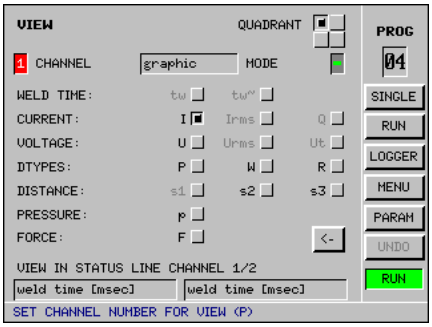
Preparations
Select button MENU with the knob/pushbutton combination and depress button.
Select button VIEW with the knob/pushbutton combination and depress button.
Screen VIEW opens, and now you may perform all necessary settings.



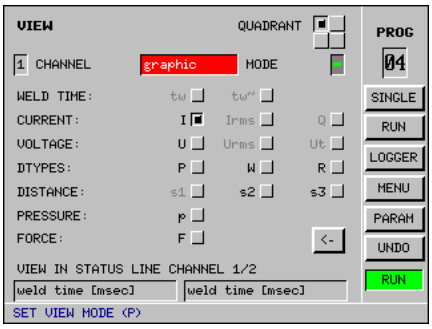
Setting the display window
QUADRANT
Here you select the display window 1...4 (quadrant) to be configured.



CHANNEL
The channel number set determines the channel that shall be represented in the display window selected.
Only one measured categories can be selected per channel and window in each case.

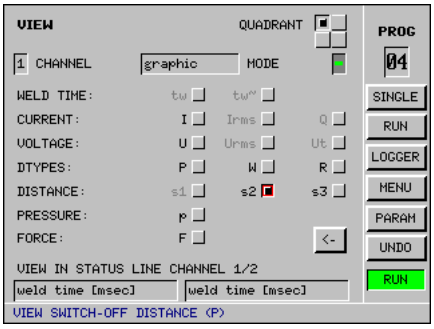


MODE
You determine in this selection field how the measured categories shall be represented.
Possible types of representation:
numeric
graphic
(using graphic representations, you may select color of the graphs in addition)
SPC*-Chart
SPC*-Values
SPC: **S**tatistical **P**rocess **C**ontrol



CURRENT, VOLTAGE, DTYPES, DISTANCE, PRESSURE, FORCE
Select the desired measuring category for the selected display window here.

DISTANCE (displacement)
Only during active displacement control and/or part detection (see Section xxx).
s1 = Part detection channel 1
s2 = Cutoff value channel 1
s3 = Sinking depth value channel 1
s4 = Part detection channel 2
s5 = Cutoff value channel 2
s6 = Sinking depth value channel 2

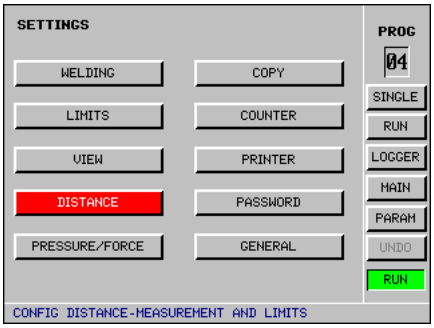


Button <-
This button lets you reach the next configurable display window.

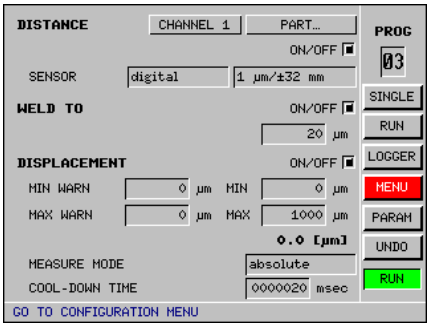
5.6 Displacement Measuring (digital or analog)

Preparations

- Connect the displacement measuring system as described in section 3.1.5.
- Select button MENU with the knob/pushbutton combination and depress button.



- Select button DISTANCE with the knob/pushbutton combination and depress button.
- Screen DISTANCE opens, and now you may perform all necessary settings.



Configuring displacement measurement

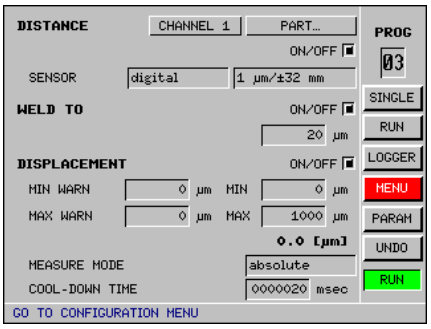
CHANNEL
Select the channel, which the displacement measuring system is connected to.

ON/OFF
Enables/disables displacement measuring.

PART
When button ON/OFF is enabled, parts detection is enabled (see also X38 outputs) (see also outputs X38).

MIN/MAX
Value for minimum/maximum displacement specifications for monitoring automatic part detection.
Monitoring is active if both values are zero.

MEASURE MODE
You determine the operating mode through this input field. You can select between **absolute** (standard) and **reference**.
In operating mode **absolute**, the distance (path) is measured that the welding head has actually covered.
In operating mode **reference**, the distance between both electrodes is determined.
Note
This is only for parts detection.



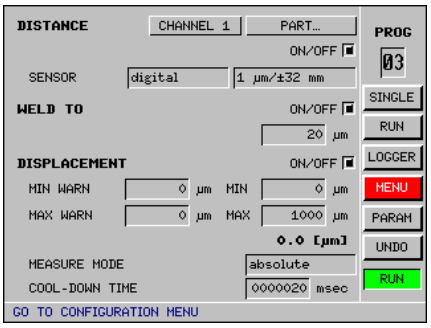
REFERENCE MEASURING
Enabling button START will start reference measuring.
If reference measuring is concluded, you need to disable the button again. Now the determined reference value displays to the right, beside the button.

Caution

To avoid damage to electrodes and welding installation, you need to perform a reference run:

- prior to first measurement
- after any change on the electrodes
- after any change on the welding head

Right above you can toggle between PART... and FINBAL..



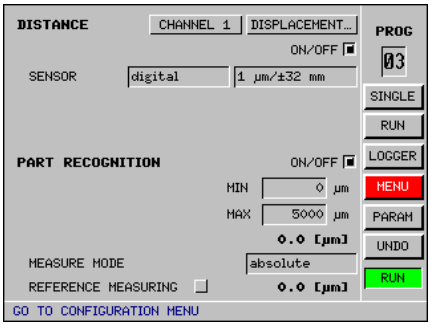
WELD TO
When button ON/OFF is enabled, the welding current is switched off as soon as the welding head has reached the displacement preset in the adjacent input field.

FINAL
When button ON/OFF is enabled, the sinking path (=displacement) is measured.
The input fields MIN/MAX pre-select the minimum or maximum sinking depth for monitoring.

If both values are zero, the monitoring is deactivated.

The input fields MIN WARN/MAX WARN force the minimum or maximum warning values for monitoring.
The monitoring is deactivated with both values 0.

SENSOR
Here you determine the signal form (**digital / analog**) and resolution of the displacement measuring system connected.
The maximum measurable stroke is specified additionally in the case of the digital displacement sensor.

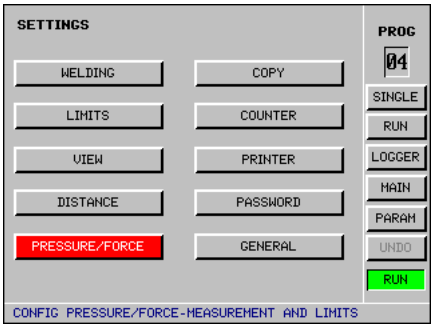


5.7 Measuring Pressure or Force

Preparations

The WKT card also allows measuring pressures or forces as option.

- Switch off measuring instrument MG3 Digital.
- Attach the sensors to the welding installation.
- Connect the pressure or force sensors to the adapter.
- Connect the adapter to socket X31 on the rear side of the equipment.
- Switch on again measuring instrument MG3 Digital.
- Select button MENU with the knob/pushbutton combination and depress button.
- Select button PRESSURE/FORCE with the knob/pushbutton combination and depress button.
- Screen PRESSURE/FORCE opens, and now you may perform all necessary settings.



Configuring pressure / force measurement

ON/OFF

Enables/disables pressure or force measurement. Both buttons are software-latched against each other so that only one quantity can be measured.

MIN/MAX

Values for the minimum/maximum permissible pressure or force.
If both values are zero, the monitoring is deactivated.

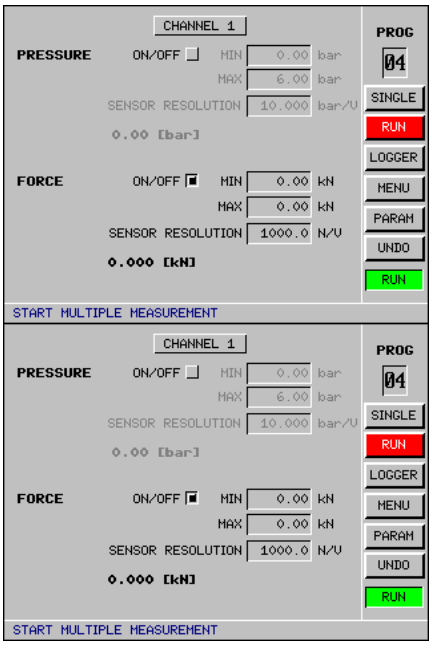
SENSOR TYPE

Pressure sensor

Pressure sensors with a linear curve should be used. The no-load measured value for the sensor is entered in the OFFSET field. Input in the SENSOR RESOLUTION field is realized in bar/V or psi/V.
The maximum possible resolution is 10 bar/V.

Force sensor

Force sensors with a linear curve should be used. The no-load measured value for the sensor is entered in the OFFSET field. Input in the SENSOR RESOLUTION field is realized in N/V or lbs/V.
The maximum possible resolution is 1000 N/V.



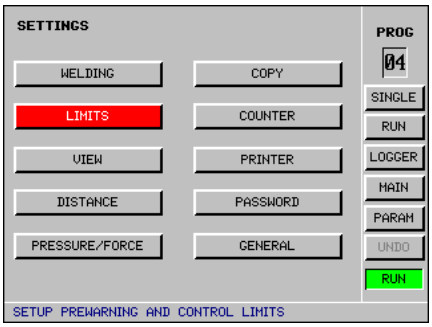
CALIBRATION:
Pressure/Force values are continuously transmitted for display if the CALIBRATION button is activated. Proceed as follows for two-point calibration:

- Resolution setting = 1 and offset = 0 (direct display of sensor output voltage) and activation of calibration
- Record 2 measuring points with 2 calibrated reference densities, note reference density and sensor voltage
- Calculate resolution and offset with following formula:
  Resolution = (F2-F1)/(U2-U1)
  Offset = F1-(resolution · U1)
- Set resolution and offset and deactivate calibration again:
  U1,2 ...sensor voltage 1 and 2, F1,2 force value of reference densities (g = 9.81m/s²)

5.8 Determining Limit Values

Preparations

- Select button MENU with the knob/pushbutton combination and depress button.
- Select button LIMITS with the knob/pushbutton combination and depress button.
- Screen LIMITS opens, and now you may perform all necessary settings.



Notes

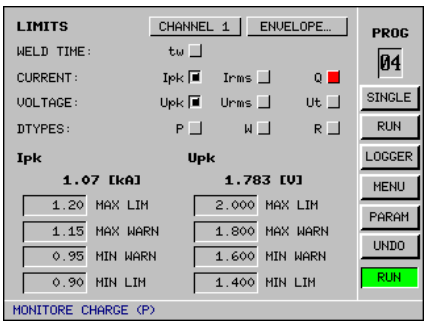
- You can determine maximum two values to be monitored per channel.
- Evaluation of the limit values after each measurement.

The evaluation result is:
- displayed by the LEDs on the equipment front page,
- logged, and
- made available by the digital output at the equipment rear side.

- The evaluation result is formed by a logical OR link if both channels are monitored and the measurement occurs simultaneously.

Defining limits

MAX LIM, MAX WARN, MIN WARN, MIN LIM
Here you determine the limits for the minimum or maximum warning and limit value.
Limit value monitoring is deactivated if the min. and max. limit are set at zero. The same applies to warning limits.

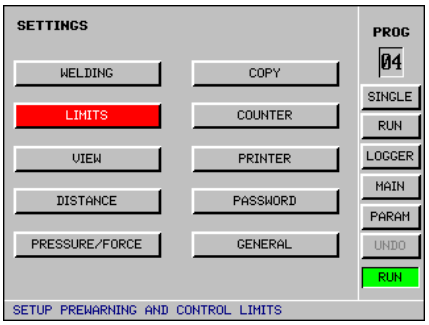


5.9 Generating Reference Waveforms and Envelope Waveforms

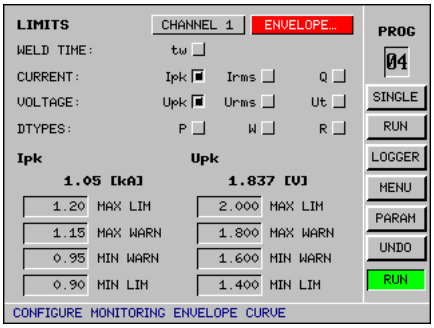
A reference waveform is the mean waveform derived from **n** trial welding operations.

Preparations

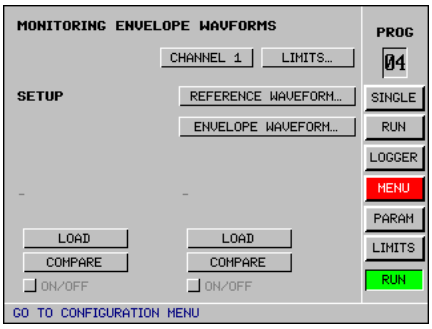
- Select button MENU with the knob/pushbutton combination and depress button.
- Select button LIMITS with the knob/pushbutton combination and depress button.
- Screen LIMITS opens.



- Select button ENVELOPE with the knob/pushbutton combination and depress button.

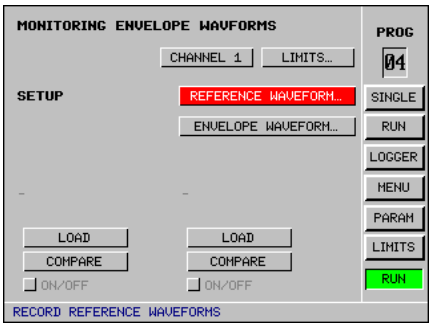


- Screen MONITORING ENVELOPE WAVEFORMS opens, and now you can:
- generate a reference waveform and an envelope waveform by yourself, or
- load an envelope waveform.

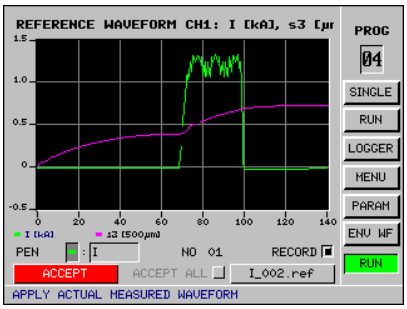


Generating a reference waveform

- Select button REFERENCE WAVEFORM with the knob/pushbutton combination and depress button.



Screen REFERENCE WAVEFORM opens, and now you can generate a reference waveform.



PEN
Assigns a color to a quantity.

NO
States the number of measurements (1…99) out of which the arithmetic mean shall be derived.

RECORD
As soon as a measurement has been carried out, it can be used for taking of the mean by depressing button ACCEPT. Now value NO is decreased by 1 automatically. Repeat this process until all measurements were performed.

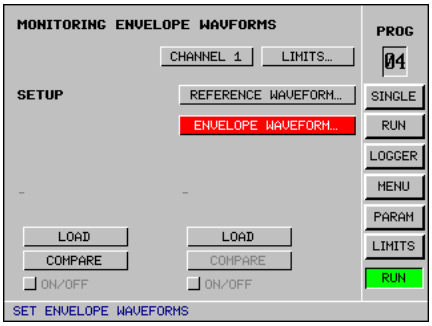
ACCEPT ALL
Enabling the ACCEPT ALL button draws on every triggered waveform to form the mean value until the value NO is zero.

I_001.ref
File designation for the reference waveform generated. Reference waveforms have the file extension ***.REF**.

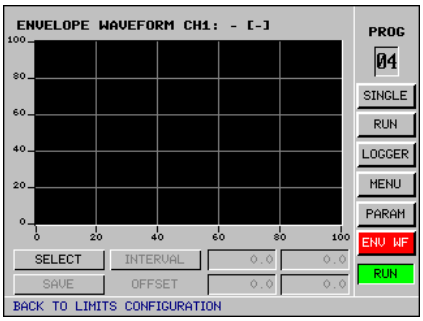
The reference waveform is automatically stored on the compact flash card when all measurements were performed.

An envelope waveform is formed from a reference waveform and is used for the additional monitoring of a weld variable.

Generating an envelope waveform



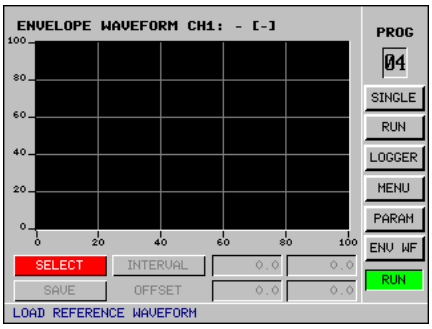
- Select button ENVELOPE WAVEFORM with the knob/pushbutton combination and depress button.



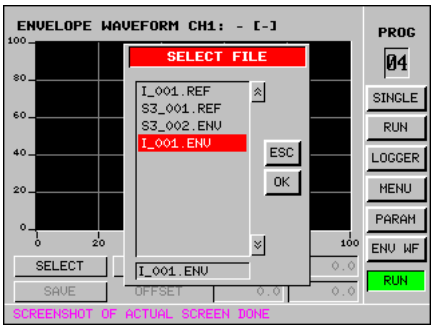
- Screen ENVELOPE WAVEFORM opens.

  A reference waveform previously generated is shown in the dialogue field. You can then continue directly with INTERVALL.

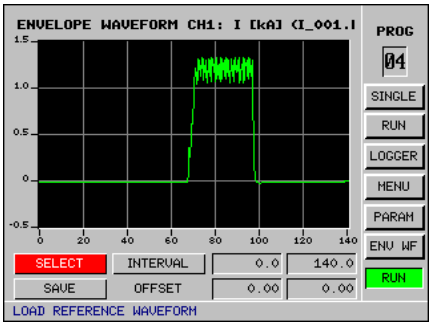
- Select button SELECT with the knob/pushbutton combination and depress button.



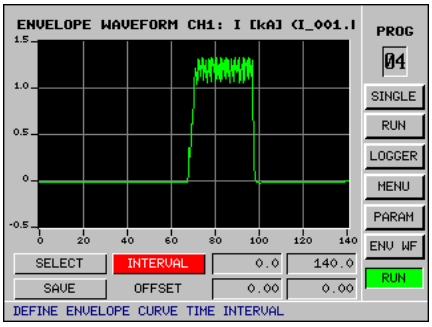
- Screen ENVELOPE WAVEFORMS opens, and now you can:
  - open and edit an existing envelope waveform (*.ENV), or
  - open a reference waveform (*.REF) and determine the envelope waveform by yourself.



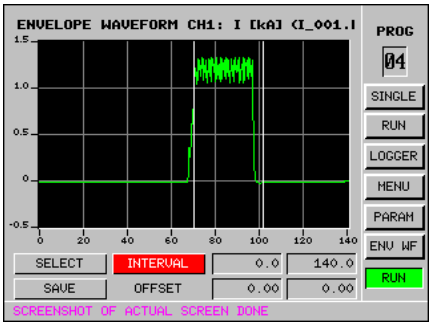
- Open file, e.g. I_001.REF
- Screen ENVELOPE WAVEFORM opens, and now you can generate an envelope waveform with the reference waveform loaded.



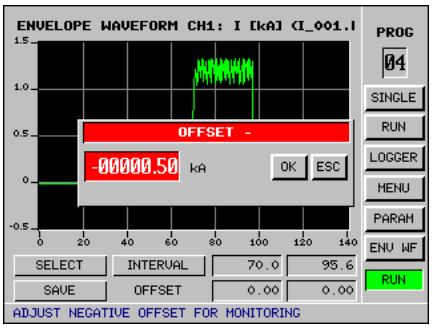
- Select button INTERVAL with the knob/pushbutton combination and depress button.
- You will now see a white vertical line that you can move by rotating the knob/pushbutton combination.



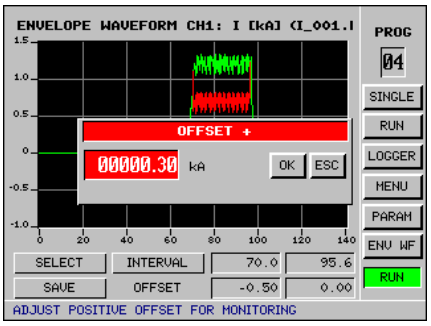
- Select the position at which the monitoring interval or time slot should commence and press the button.
- You will now see a second white vertical line that you can move by rotating the knob/pushbutton combination.
- Pressing the button again allows you to determine the time slot at which the envelope waveform should end.



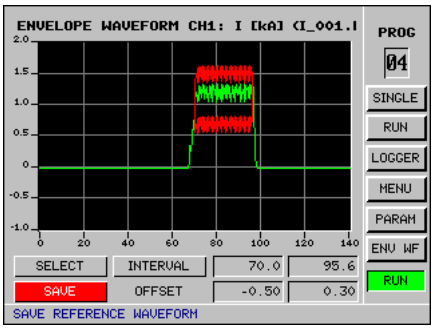
- Select the left input field with the knob/pushbutton combination and depress button.
- Screen OFFSET- opens, and you can determine the lower limit value for the envelope waveform in the input field.
- Exit screen OFFSET- with OK.



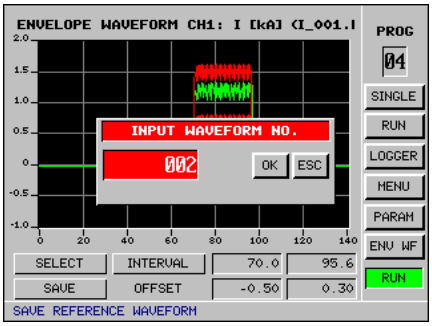
- Select the right input field with the knob/pushbutton combination and depress button.
- Screen OFFSET+ opens, and you can determine the upper limit value for the envelope waveform in the input field.
- Exit screen OFFSET+ with OK.

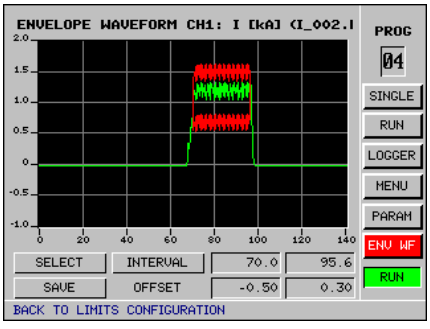


- Now the envelope waveform is finally configured, and can be saved now or be changed once again.



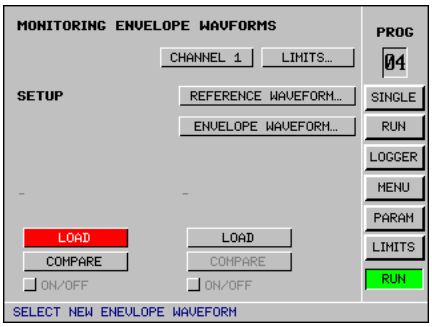
- Select button SAVE with the knob/pushbutton combination again and depress button.
- Screen INPUT WAVEFORM NO. opens.
- Now enter a number for the envelope waveform in the input field. If this file number has been assigned already you will be asked whether you want to overwrite it. If this is not the case, then enter a new number in the input field.
- Exit screen INPUT WAVEFORM NO. with OK.
- The ENV WF button is used to return to the envelope waveform monitoring menu.



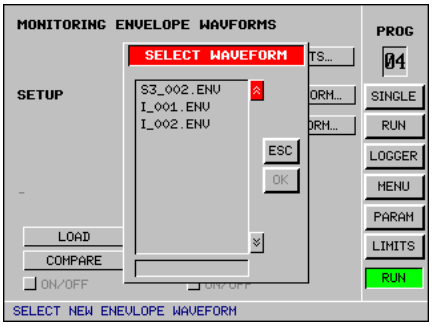


Loading an envelope waveform

- Select button LOAD with the knob/pushbutton combination and depress button.
- Screen SELECT WAVEFORM opens.
- From the files list, select an envelope waveform.



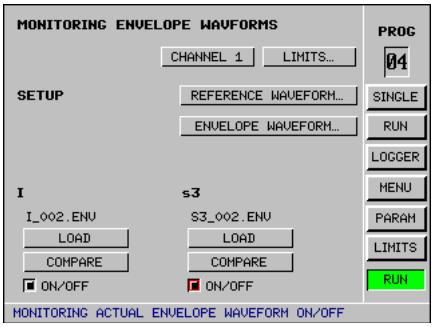
- Exit screen SELECT WAVEFORM with OK.
- The envelope waveform selected is loaded now.



Remark:
An inquiry is generated as to whether you wish to load the envelope waveform last processed if no CompactFlash card is plugged in. Simply acknowledge with OK if you wish to do this.

ON/OFF
Envelope waveform monitoring is activated by pressing the button.

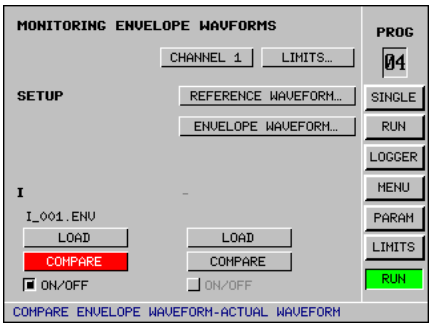
2nd envelope waveform
A maximum of two envelope waveforms can be loaded. These independently monitor a signal sequence.



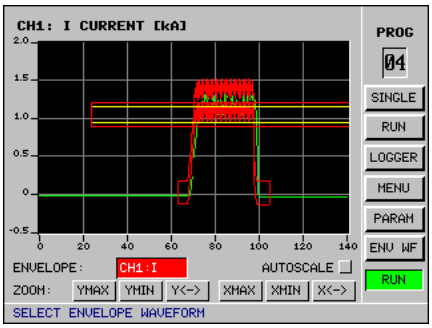
You can return to the limit value setting with the LIMITS... or
LIMITS button.

Comparison of measuring waveforms and envelope waveforms.

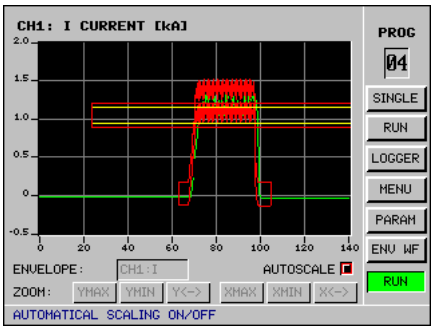
COMPARISON
Press the COMPARE button to compare the loaded envelope waveform with the currently measured waveform.



A envelope waveform can now be selected in the selection field next to ENVELOPE WAVEFORM if you have loaded at least two.

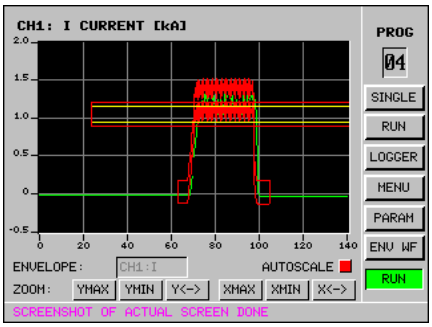


AUTOSCALE
The image mode is determined with the button. Scaling is automatically selected if the button is pressed which generates the best image of the current envelope waveform.



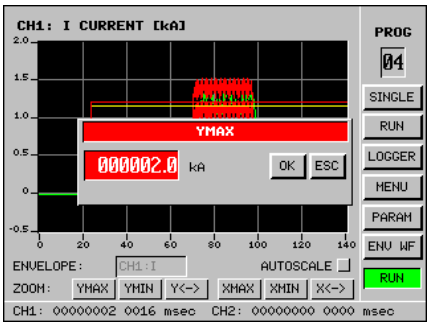
The ZOOM enlargement mode is activated if the button is **not** pressed. The line is activated.

Note
Press AUTOSCALE and the selected measurement variable is automatically and optimally adapted to suit the diagram.
This function can also be utilized to achieve a clear representation again.

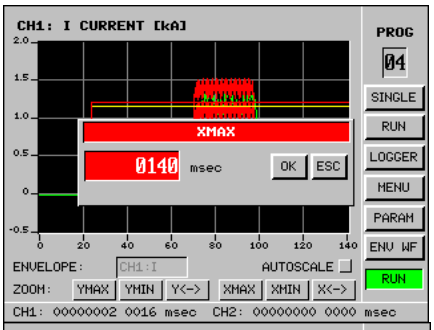


Enlarging menu (Zoom)

YMAX / YMIN
Press YMAX or YMIN to determine the upper or lower scale value for the e**nvelope waveform** selected in the PEN field.

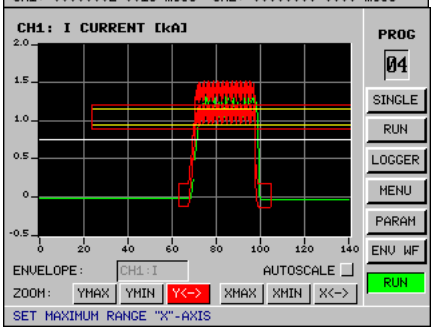


XMAX / XMIN
Press XMAX or XMIN to determine the upper or lower scale value of the X-axis for **all** illustrated measurement variables.

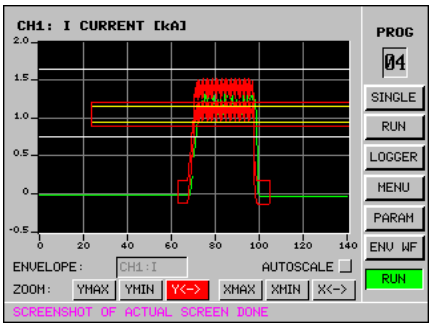


Y<-> / X<->
A range can be determined with Y<-> and X<-> which will subsequently be enlarged.

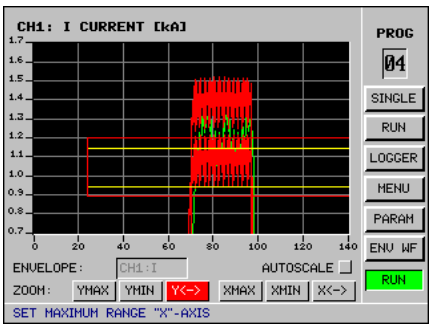
A white line appears if Y<-> or X<-> is selected. Turn the knob/button to offset the line. Press the button to set the limit.



A second white line appears simultaneously which initially lies on top of the first line. Turn the knob/button again until the second line has reached the limit. Press the button and the diagram is illustrated in an enlarged version.

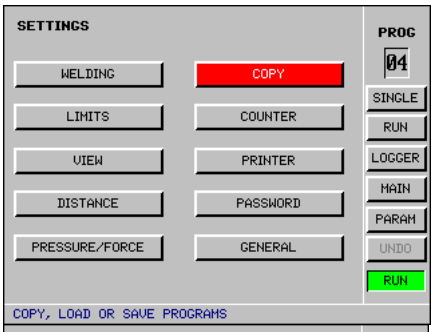


Selecting the display window or ENV WF (ENVELOPE WAVEFORM) button enables you to return to the envelope waveform monitoring menu.

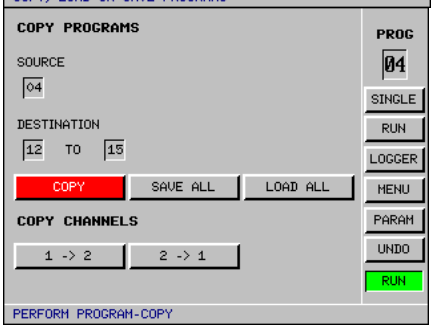


5.10 Copying, saving and loading Programs and Parameters

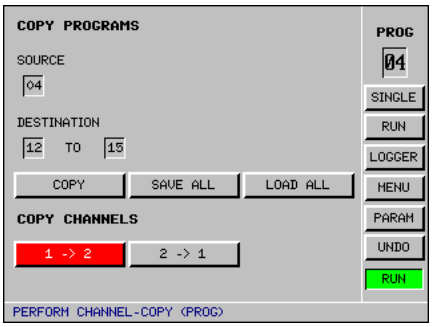
Copying Programs and Parameters
Select button MENU with the knob/pushbutton combination and depress button.
Select button COPY with the knob/pushbutton combination and depress button.



Screen COPY PROGRAMS opens, and now you may perform all necessary settings.
Enter number of source program into input field SOURCE.
In the input field DESTINATION, enter the number of the first target program and the number of the last target program, which the source program and all parameters shall be copied to.
Finally depress button COPY. This will initiate the copy process.

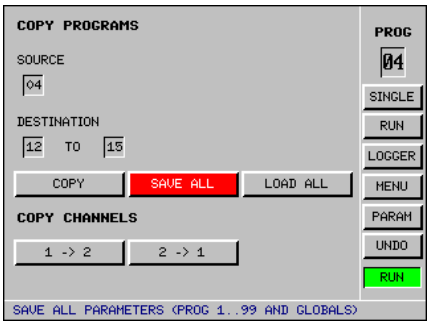


Copying a channel
Select the channel to which others are to be copied with the knob/button.
Press the selected button 1 → 2 or 2 → 1. This triggers the program parameter copying procedure within the current program.



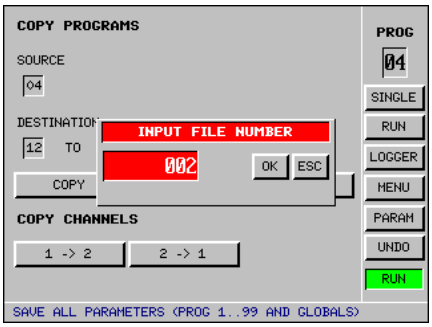
Saving all programs and parameters

- Select button SAVE ALL with the knob/pushbutton combination and depress button.
- Screen INPUT FILE NO. opens.
- Enter a file number into the input field.

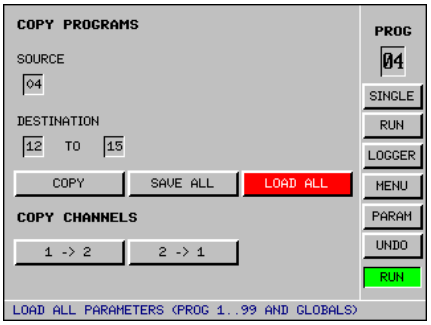


- Finally depress button OK. This will initiate the saving process.

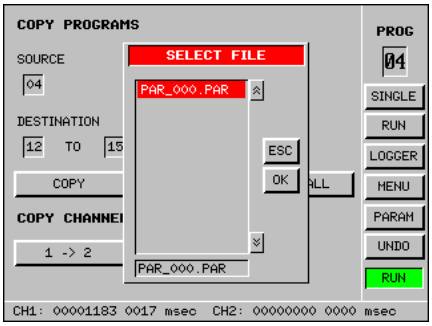
Parameter data have the file extension ***.PAR**.



Loading all programs and parameters
Select button SELECT ALL with the knob/pushbutton combination and depress button.
Screen SELECT FILE opens.



Select a file from the files list.
Finally depress button OK. This will initiate the loading process.



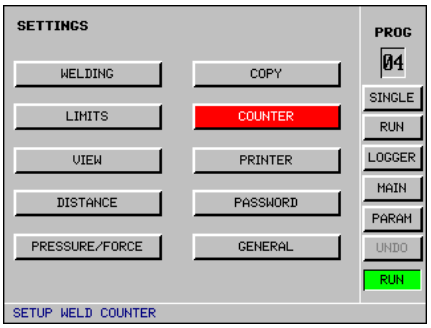
5.11 Counting Measurements

Notes

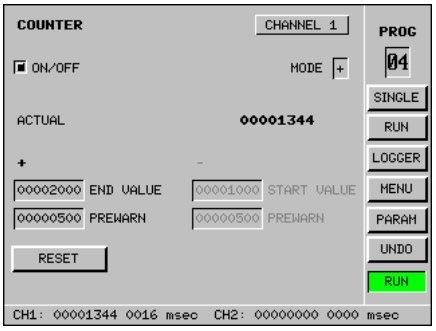
- On this screen, you can determine the welding numbering system for channel 1 and 2.
- The signal at the digital output on the rear of the device becomes available when the set pre-warning value is reached.
- The signal at the digital output on the rear of the device becomes available when the end value (numerical direction +) or zero (numerical direction -) is reached.

Procedure

- Select button MENU with the knob/pushbutton combination and depress button.
- Select button COUNTER with the knob/pushbutton combination and depress button.



- Screen COUNTER opens, and now you may perform all necessary settings.



ON/OFF
Enables/disables the counter for the respective channel

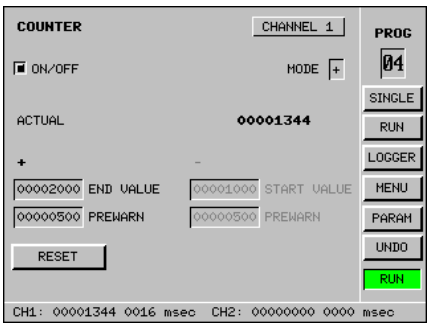
MODE
Indicates counting direction.
Plus (+) counts forward
Minus (-) counts backward

END VALUE
Last counter value of plus counter

START VALUE
First counter value of minus counter

PREWARN
Pre-warning value of active counter

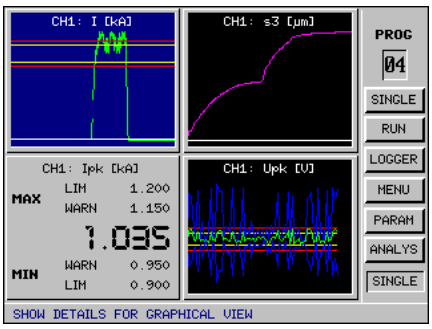
RESET
Depressing button RESET resets the counter.



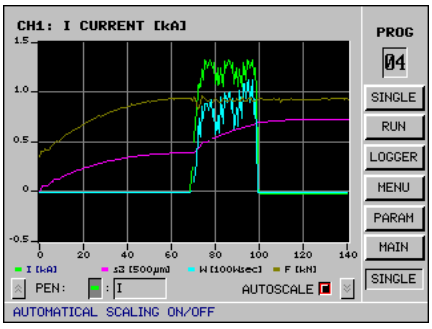
5.12 Viewing and Saving Measuring Waveforms

Procedure

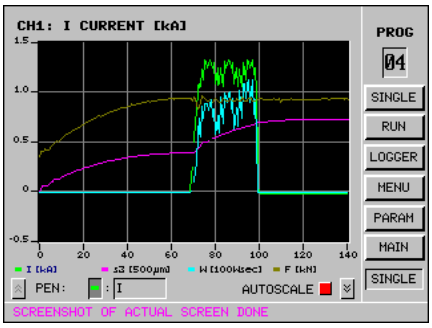
- Select a quadrant with the knob/button which is configured for the graphic display and press the button.



- The quadrant opens into a full image.

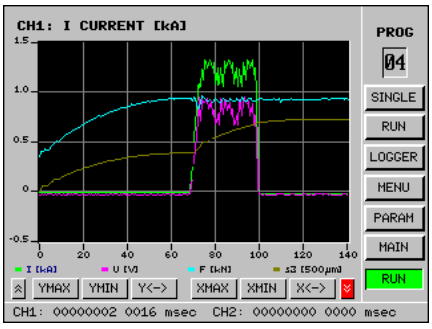


AUTOSCALE
The image mode is determined with the button. Scaling is automatically selected if the button is pressed which generates the best image of the current quadrant measurement variable.
This primary measurement variable is illustrated in the heading
The **viewing, enlarging** and **memory menu** is activated if the button is **not** pressed. The double arrow next to the button is activated.

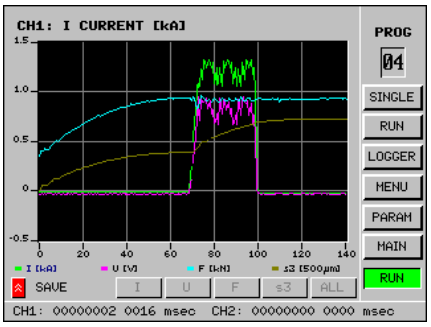


Note
Press AUTO SCALING and the selected measurement variable is automatically and optimally adapted to suit the diagram.
This function can also be utilized to achieve a clear representation again.

DOUBLE ARROW
Select the double arrow pointing downwards with the knob/button and press the button.
The double arrow pointing downwards enables you to move one level down to the enlarging menu.
The CURSOR menu is accessed by pressing the double arrow again, and the SAVE menu is accessed by pressing it again.

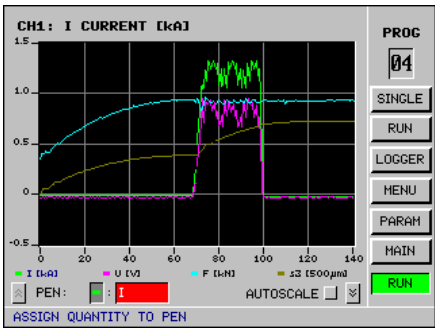


The double arrow pointing upwards is located on the left-hand side and can be used to reach the first level again in which you can allocate the graph individual colors with the PEN selection field.



PEN

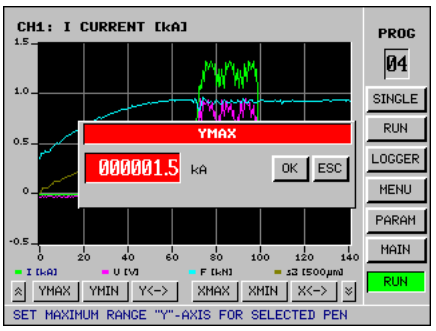
The colors green, red, blue and brown can be selected in the field next to PEN.
The selected pen color can be allocated a physical dimension in the adjacent selection field.
Enter a " – " here if you do not desire an enlarged representation.
The last variable entered becomes the primary measurement variable to which the Y-axis scaling relates.
The primary variable can be recognized by the fact that it is shown in the heading and illustrated in blue in the legend.



Enlarging menu (Zoom)

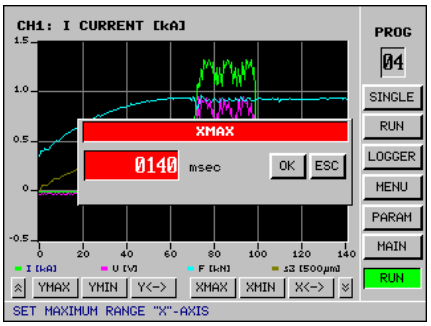
YMAX / YMIN

Press YMAX or YMIN to determine the upper or lower Y-axis scale value for the **primary measurement variable** selected in the PEN field.



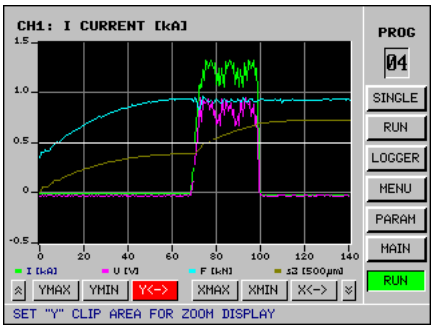
XMAX / XMIN

Press XMAX or XMIN to determine the upper or lower scale value of the X-axis for **all** illustrated measurement variables.

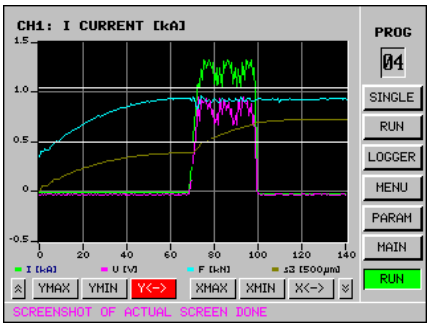


Y<-> / X<->

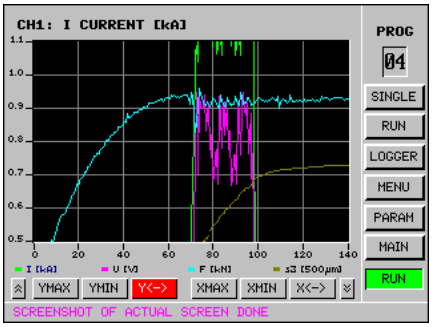
A range can be determined with Y<-> and X<-> which will subsequently be enlarged.
A white line appears if Y<-> or X<-> is selected. Turn the knob/button to offset the line. Press the button to set the limit.



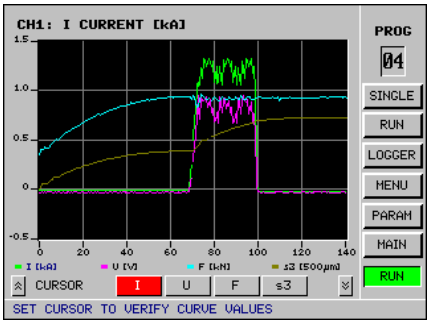
A second white line appears simultaneously which initially lies on top of the first line. Turn the knob/button again until the second line has reached the limit.



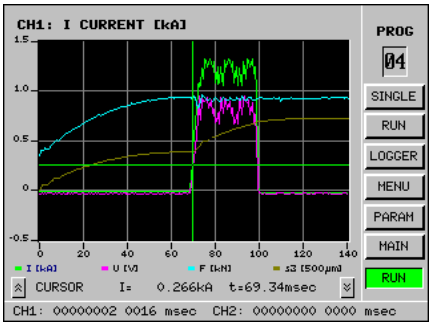
Press the button and the diagram is illustrated in an enlarged version.



Cursor menu
Select the double arrow to reach the CURSOR level.
Select one of the four possible measurement variables and press the button.

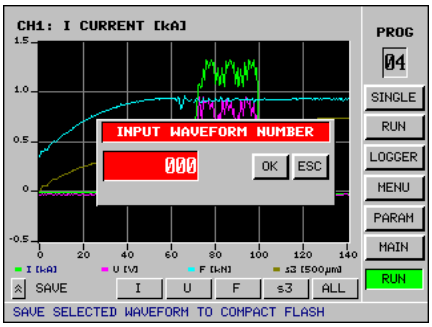


A crosshair (cursor) appears on the display in the color allocated to the measurement variable. The cursor can be moved on the graph by turning the knob/button.
The value pair belonging to every measurement value is displayed numerically below.
Press the button again to exit the cursor mode.



Memory menu

The memory menu for saving the complete measurement values of individual or all measuring waveforms on the CompactFlash card is located one level lower.
Select a measurement variable and press the button.
Allocate the measurement series a number under which it should be saved.
The files are saved in the “Waveform” directory with the suffix *.CRV. The respective formula symbol of the measurement variable in question precedes the file name.



The double arrow pointing upwards enables you to move one level higher again.
You can return to the quadrant view again by selecting the display window or the MAIN button.

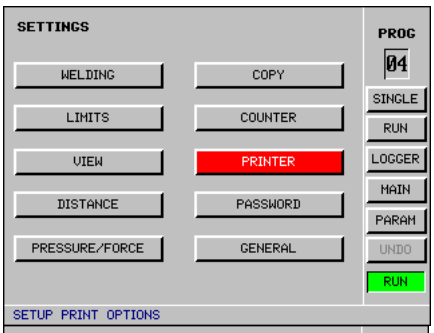
5.13 Printing Measurement Values

Notes

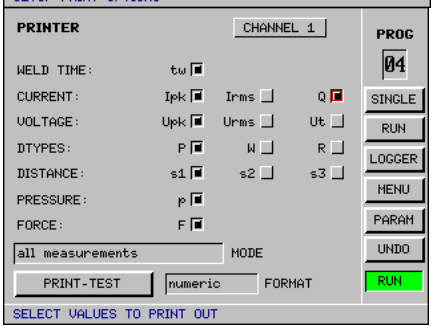
- For data evaluation, both a PC with PECO software (WinWeld) and/or a printer can be connected to the serial interface.
- On this screen, you can determine the values to be sent through the serial interface to the PC or be output by the printer.
- You can enable as many values as you like.
- You can determine different values for channel 1 and 2.

Procedure

- Select button MENU with the knob/pushbutton combination and depress button.
- Select button PRINTER with the knob/pushbutton combination and depress button.



- Screen PRINTER opens, and now you may perform all necessary settings.

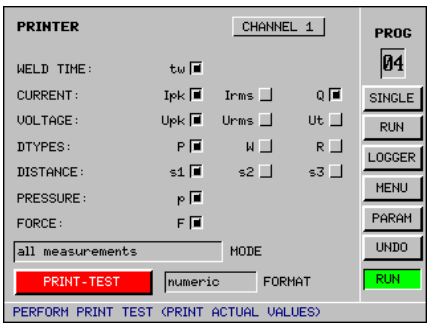


MODE
You select the printing mode through the selection field.

Possible printing modes are:

- off — function deactivated
- all — all measurements
- poor — poor measurement
- prewarning — measurement with active prewarning
- Interval — measurement with an interval from 1..10000
- Interval poor — measurement with an interval from 1..10000 + poor measurement

PRINT-TEST
Press the button to test the connection via the RS232.

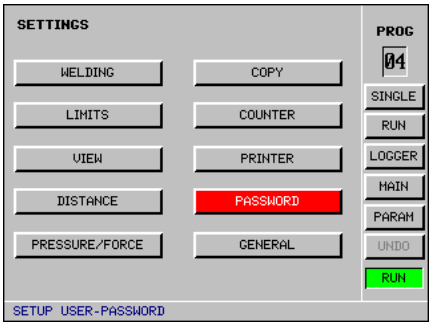


FORMAT
Set to **numeric** to transmit your data to a printer or the WinWeld program from Peco.

5.14 Determining and Changing Password

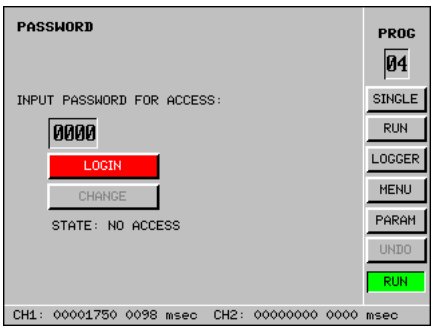
Procedure

- Select button MENU with the knob/pushbutton combination and depress button.
- Select button PASSWORD with the knob/pushbutton combination and depress button.
- Screen PASSWORD opens, and now you may perform all necessary settings.

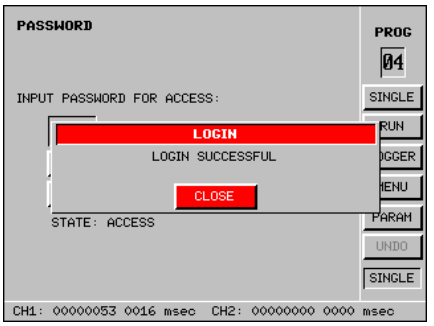


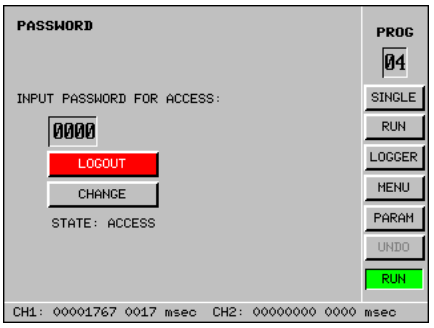
LOGOUT
You can logout through this button.
You can only carry out changes having logged on with the correct password.

CHANGE
If you have correctly logged on, you can change the password.



STATE
Indicates whether you are authorized for access or not.
Note
Password on delivery: 0000
If you should have forgotten your password, please contact our service department.

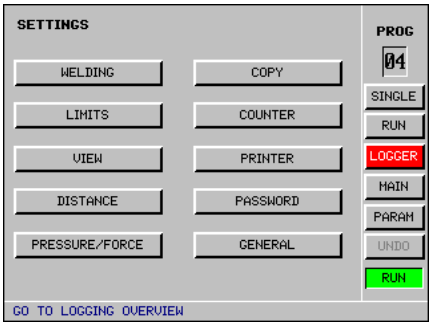




5.15 Configuring the Logger

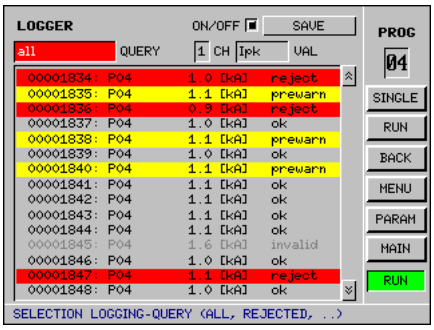
Procedure

- Select button LOGGER with the knob/pushbutton combination and depress button.
- Screen LOGGER opens, and now you may perform all necessary settings.

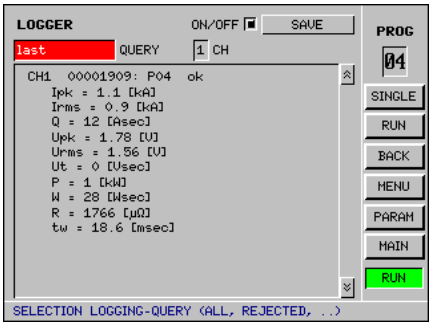


ON/OFF
When you enable this button, data acquisition will be enabled (data logging) for the shown canal.

SAVE
Pressing this button saves all values logged to this point in time on the CompactFlash card or MicroDrive.
If the compact flash card is nearly full you will be asked to change the card.



QUERY
The display mode for logged data is determined with this selection field.
Possible display modes are:
all measurements
rejected measurements
last measurement (detailed)

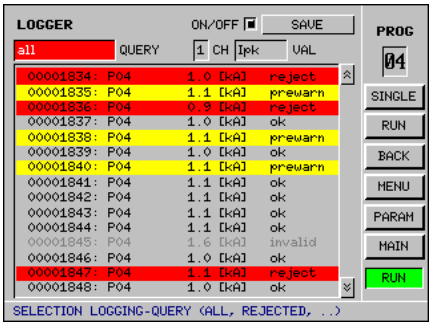


CH
Select between channel 1, 2 or 1 / 2 (only for mode “last measurement”)

VAL
Select here the value that you want to be shown.

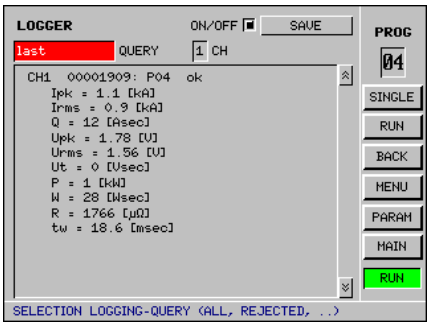
Notes

- The overall status of a measurement is illustrated with the following background colors:
  - Gray letters
    = invalid measurement (range overflow)
  - Yellow background
    = beyond the warning limit (n)
  - Red background
    = exceeded limit value
- The double arrows are used to scroll forwards and backwards through the logging history.



Additional information relating to individual measurements is shown in the detailed view (last measurement):

- a) Display of which measurement variable has exceeded the limits/pre-warning limits.
- b) Display of the direction in which the limits/pre-warning limits were exceeded:
- **+**: exceeded upwards
- **-**: exceeded downwards
- **±**: exceeded in both directions
- **HK**: if the current measurement waveform lies completely or partially outside the active envelope waveform



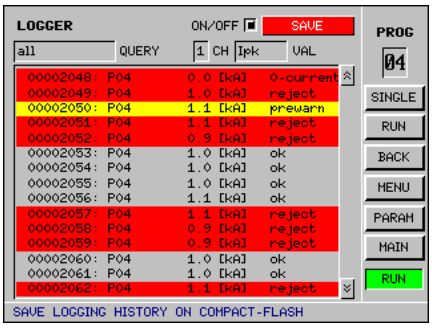
Notes

- The logger saves approx. 2500 measurements intermediately per channel. The contents are then saved in a log file and logging commences anew.
  The log file has the file suffix *.log and has a format compatible with *.csv in which time, date, counter number, program number, measurement values and status information on the measurement are saved in the form of a table.

  The overall measurement status is illustrated with the following symbols:
  V...positive measurement, no pre-warning
  X...negative measurement
  !... positive measurement, but pre-warning active
  %..invalid measurement (range exceeded,...)
  O... negative measurement (zero current)

  The details indicate the direction in which the limit value was exceeded with **+** and **-**. **( )** indicates exceeded pre-warning limits, while **{ }** indicates the exceeding of a limit determined by an envelope waveform.

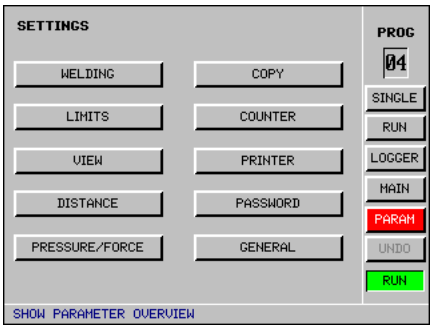
- Select the SAVE button with the knob/button and press the button if you wish to save values logged up until the present point in time.



5.16 Parameter Overview Display

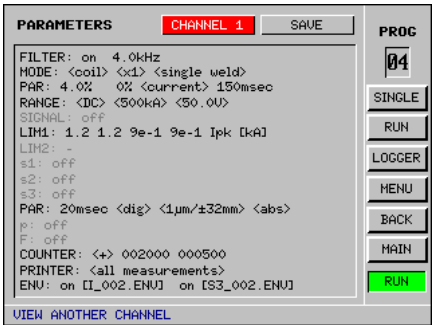
Procedure

- Select button PARAM with the knob/pushbutton combination and depress button.
- Screen PARAMETERS opens, and an overview of the most important parameters for the selected program and the selected channel is displayed.



CHANNEL 1
Depressing the button, you can change between channel 1 and 2.

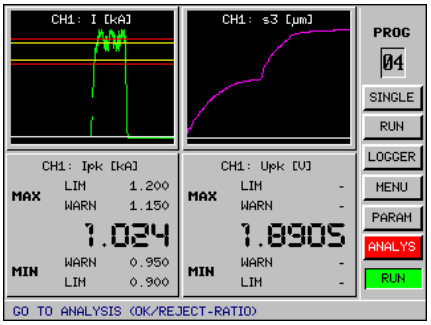
SAVE
The parameters are saved on the compact flash card as text file. The text file has the extension ***.TXT**.
Note
The text file is only readable in languages with an ANSI-compatible syntax.



5.17 Analyzing Accept-Reject Ratio

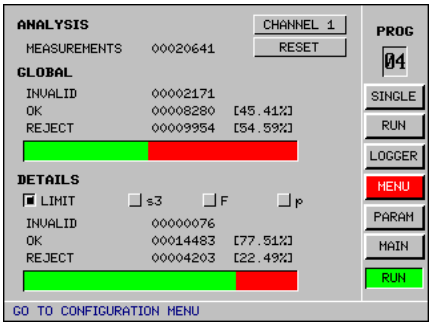
Procedure

- Select button MAIN with the knob/pushbutton combination and depress button.
- Select button ANALYSIS with the knob/pushbutton combination and depress button.
- Screen ANALYSIS opens, and now you may perform all necessary settings.



RESET
Depressing button RESET will reset all counters for the selected channel.
DETAILS
Select which positive-negative condition parallel active monitorings in the detail should have here.

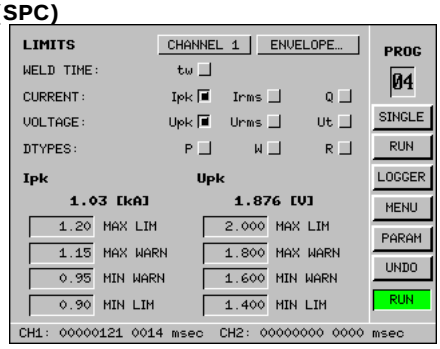
- LIMIT
  Limit value monitoring condition for freely-adjustable variables.
- s3
  Limit value monitoring condition for the penetration.
- F
  Limit value monitoring condition for the force.
- p
  Limit value monitoring condition for pressure.

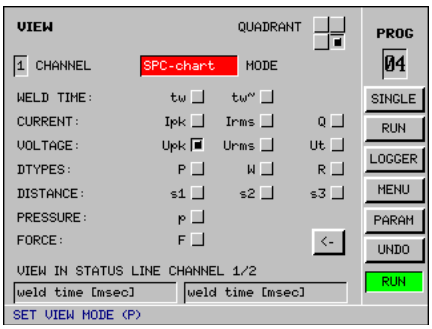


5.18 Monitoring Statistical Values

Prerequisites for statistical process control (SPC)

- **Limit values** must be activated for the measurement variable to be illustrated. Upper and lower limit values must be set to zero if the limit values are to remain temporarily inactive.
- The limit values must be reasonably preset. If there are no exact values then you will need to estimate them generously.
- A display window must be in **display mode SPC-chart**.
- As soon as the window is in SPC-chart mode, evaluation of the measured values starts. It closes as soon as the display window is reconfigured.
- In the SPC-chart, display/ calculation is carried out within sequential measurement intervals.
- Configure a display window for the SPC-chart mode.
  See section 5.5.

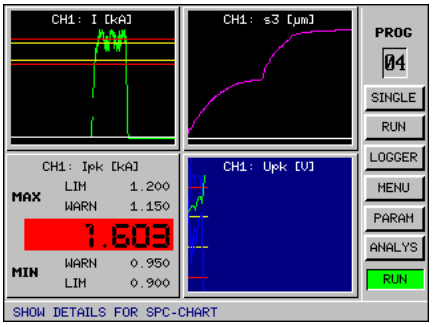




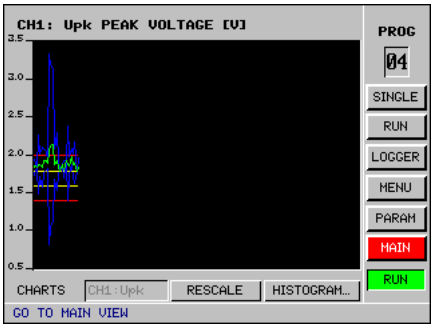
Note
In the SPC-chart you can see average and standard deviation value for the selected numbers of samples.

Procedure

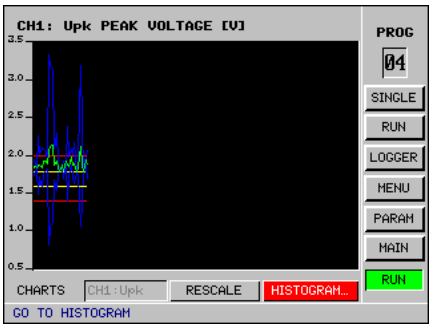
- Configure a display window for the SPC-chart mode.
  See section 5.5.
- Select this display window with the knob/pushbutton combination and depress button.



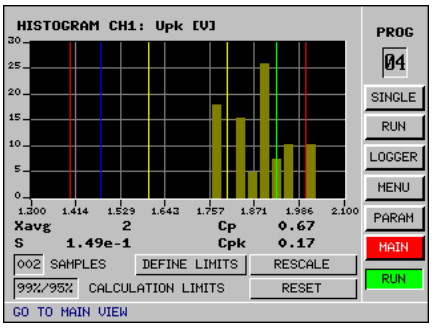
- Screen SPC-chart opens.



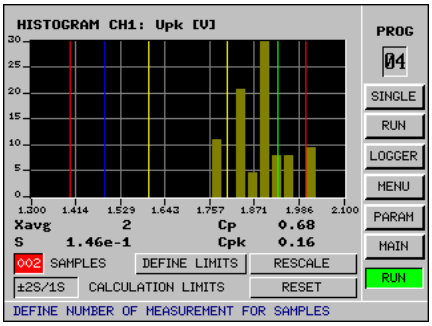
- Select button HISTOGRAM with the knob/pushbutton combination and depress button.



- Screen Histogram opens, and now you may perform all necessary settings.



SAMPLES
Through this selection field, you determine the number of measurements for a sample which shall establish the statistic.
The value in input field SAMPLES must be ≥ 1.



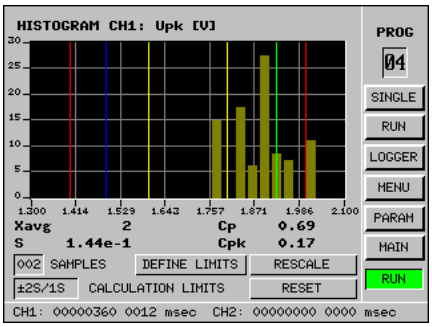
Colors
The colors in the histogram have the following meaning:

- GREEN LINE
  = average value (Xavg)
- YELLOW LINES
  = marginals
- RED LINE
  = limits
- BLUE LINE
  = standard deviation S (+/-3 sigma)

5.19 Having Limit Values Determined Statistically

Procedure

- Select button HISTOGRAM with the knob/pushbutton combination and depress button.
- Screen SPC-chart opens, and now you may perform all necessary settings.



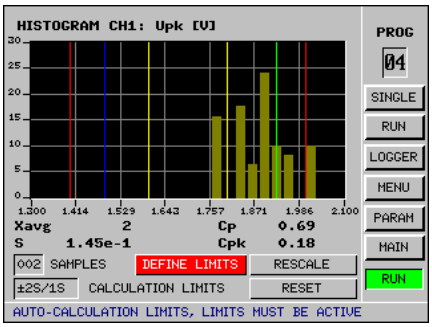
Note

Before accepting the limit values:

- Limit monitoring for the respective quantity must be enabled (i.e. the button for monitoring must be “ON”). See section 5.8.
- A large number of measurements must be recorded with the statistical evaluation enabled

The more measurements have been recorded and the larger the number of samples, the more precise the result of limit value determination will be.
In the histogram you can see average and standard deviation values calculated of all measured values.

DEFINE LIMITS
Calculates new limit values and shows a window which acknowledges that these have been imported. The newly-calculated limit values are activated if importing is acknowledged.



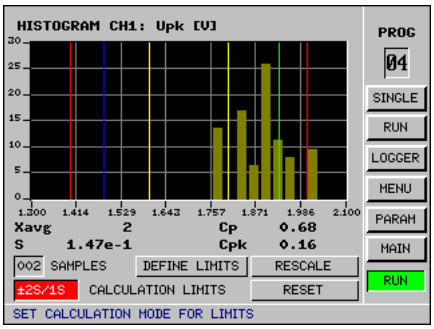
CALCULATION LIMITS

Here you can select the limit value calculation mode.

You can choose:

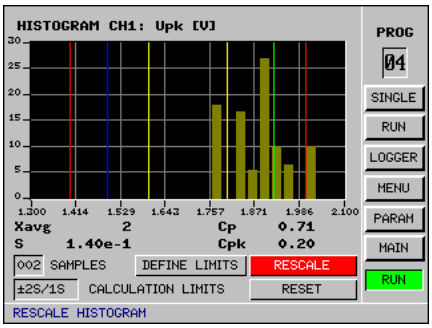
±2S / 1S
±3S / 2S
±4S / 3S
±5S / 4S
±6S / 5S
99% / 95%

The first value is standard deviation S and the second value is the deviation of pre-warning.



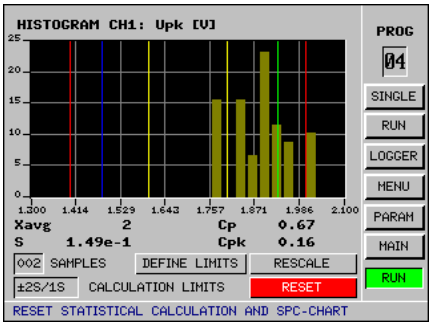
RESCALE

Adapts graphic to window.



RESET

If you depress this button, the statistical calculation will be reset.



5.20 Transferring Data to PC/Laptop



Caution

Notes

- Disable the compact flash card before removing it from the PC and use it with measuring instrument MG3 Digital.
- Switch off measuring instrument MG3 Digital before you pull out compact flash card from measuring instrument MG3 Digital.

File structure

Data of the compact flash card or MicroDrive is stored in three directories.

- DATA contains files with the file name extensions:
  - *.bmp (screenshots)
  - *.txt (text file of the parameters)
  - *.par (parameter file)
- LOGGING contains files with the file name extensions:
  - *.log (log file)
- WAVEFORM contains files with the file name extensions:
  - *.env (envelope waveform)
  - *.ref (reference waveform)
  - *.crv (measured curve)

Notes on file formats

- Files with file name extensions *.log, *.env, *.ref, and *.crv are saved as CSV format (Comma Separated Value format), and can be further processed with Excel for instance.
- Files with file name extension *.par can be
  - read,
  - edited and adapted in another program of PECO, and
  - written back again.

5.21 Creating a Screenshot of the Current Display

A screenshot can be made of every display in almost any preferred form, and this can be saved as a *.bmp file on the CompactFlash card and used at a later date. The knob/button must be pressed continuously for longer than 3 seconds for this purpose. The LED on the CompactFlash card illuminates for a few seconds if the screenshot has been successfully realized and a message is generated in the status line. The files have the prefix "SSH_xxx" and suffix "*.bmp" and receive a number which is incremental with the screenshot.

5.22 Registering the Device

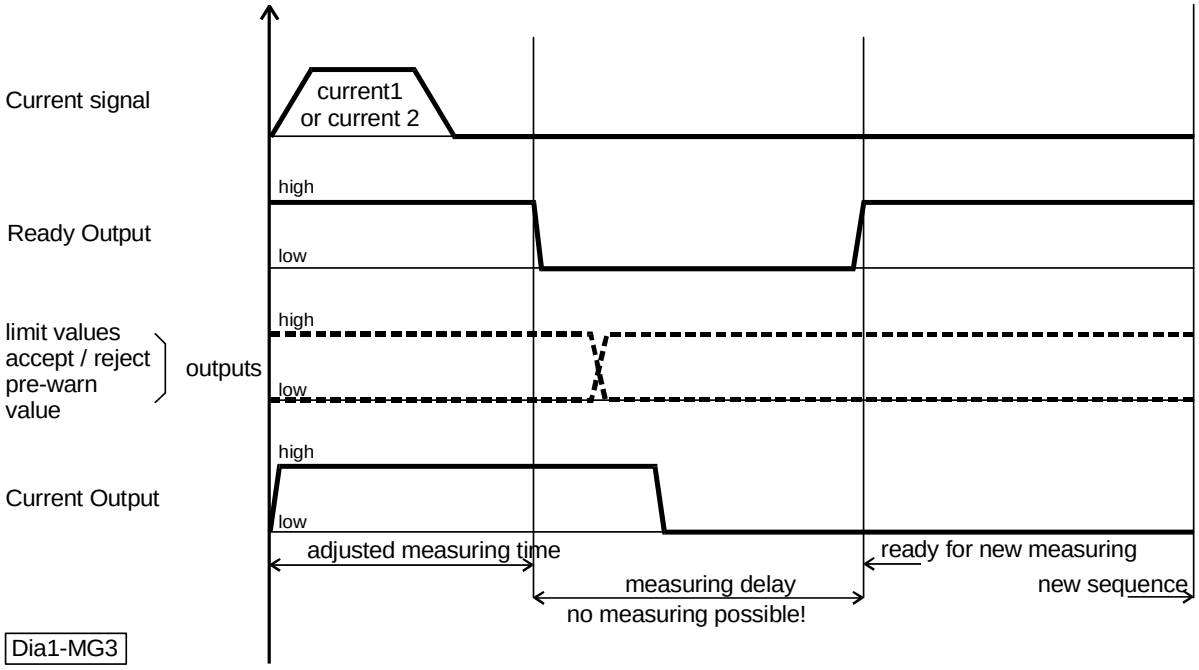
It may be necessary to register the device with PECO if it is to be operated for an unlimited period of time (depending on the version delivered).
The **MG3 Digital** can be supplied as a 30-day test version or full version with a utilization right for an unlimited period of time. You can check this by switching to the PASSWORD menu. A serial number and a “Register” button are visible in the lower half of the window in the case of the 30-day test version. The remaining days left for free utilization of the device as a test version are also displayed. The lower half of the window is empty in the case of the full version.
All full version functions can be used in the test version. However, all operating elements are blocked when the test version time period expires, and a request to enter a password appears.
You must request the password by e-mail or telephone from PECO. It is necessary to give the serial number (S/N) displayed for this purpose. You then receive a 4-digit code which you should enter in the password input field. You then click the "Register" button. The device is now enabled for unlimited use if the code has been edited correctly.

6 Integration in Automated Installations

Integrating measuring instrument MG3 Digital in an automated installation, take care to have the MG3 Digital ready signal always co-evaluated by a higher-level stored-program controller (SPC).
There must be no triggering as long as the ready signal is “low” (measuring interval). During this measuring interval, data is calculated, compared, and transferred to the display and further interfaces.

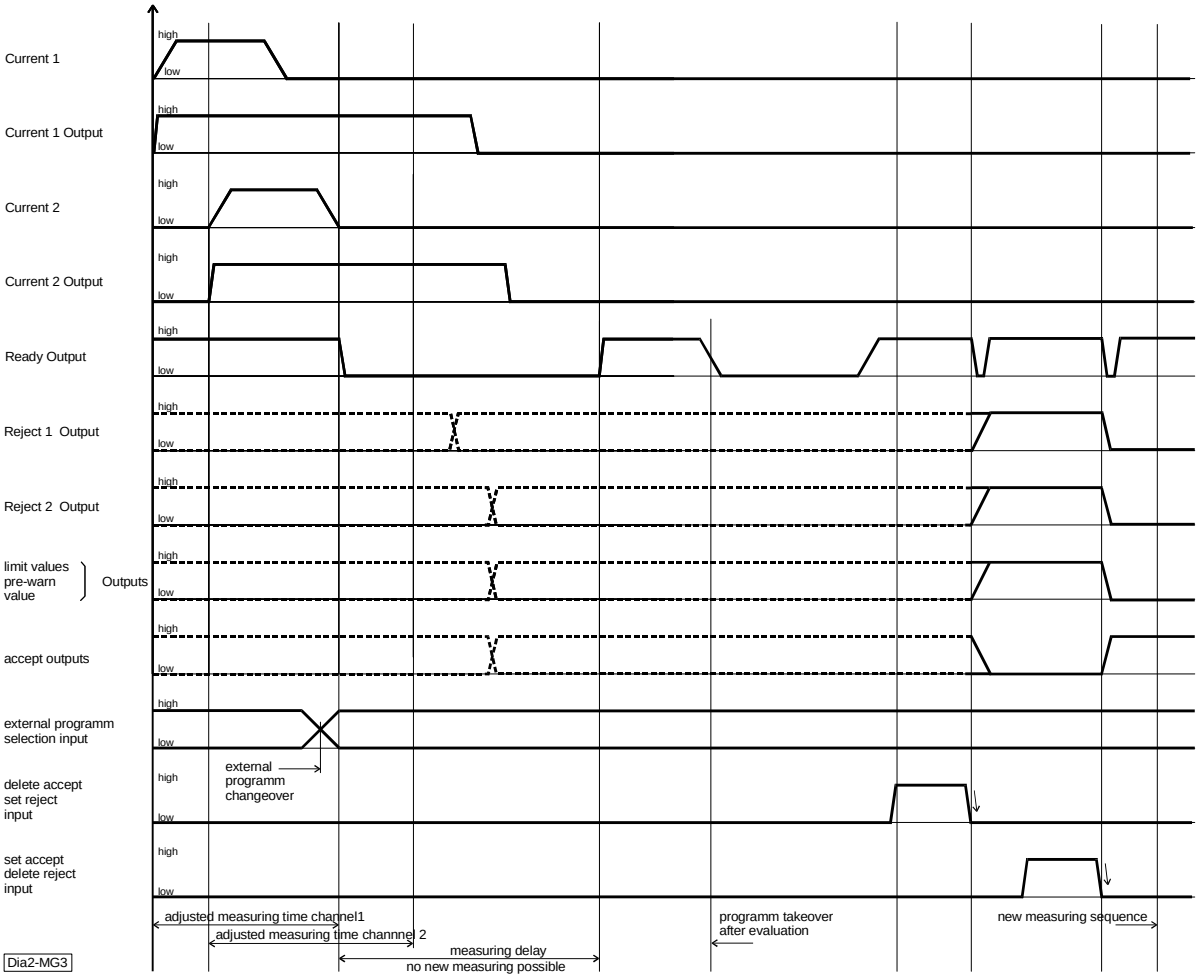
In the following chapter, flow charts illustrate the time sequence of the signals by a number of examples.

6.1 Flow Chart Channel 1 or Channel 2 alone



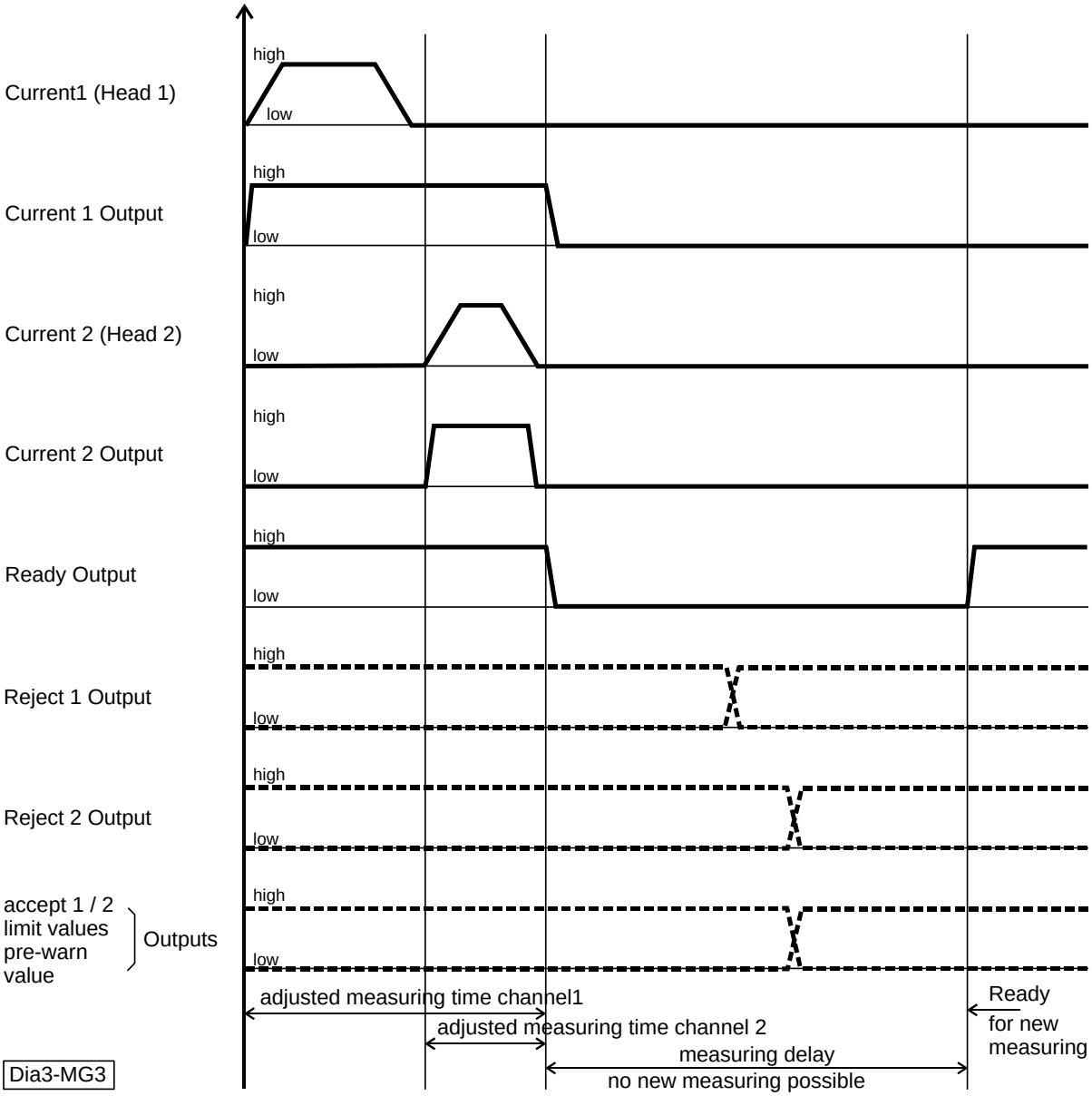
Dia1-MG3

6.2 Flow Chart Channel 1 and Channel 2 Parallel



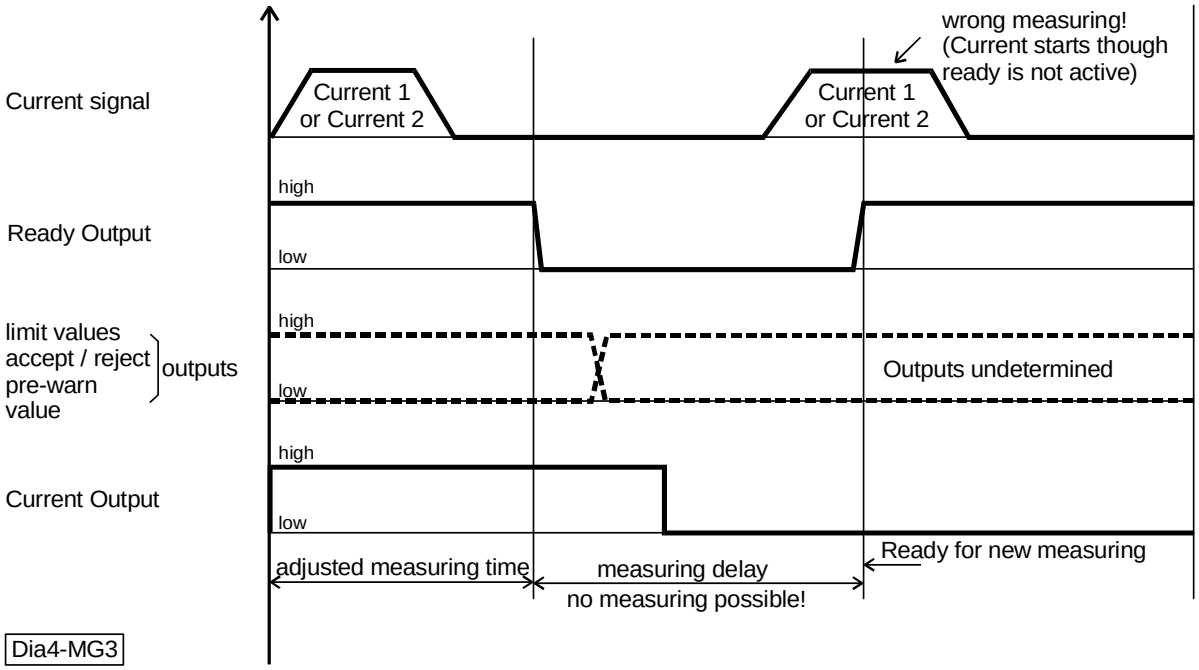
Both measuring times need to be set generously enough so that they overlap in a 2-channel parallel measurement.
As soon as the current outputs become “low” (within measuring interval), evaluation of the set outputs can commence.
New measurement can be only started after the ready signal is “high”.

6.3 Flow Chart Channel 1 and Channel 2 Parallel, but Current 1 and Current 2 do not Overlap



The pause between the first and second current is too short here to evaluate the first measurement. The measuring time for the current started first (channel 1) should be set here so that it overlaps the measuring time of the second current (channel 2). Start of evaluation of the first current is delayed as a result. A parallel 2-channel measurement of the second current can be realized here because the Ready signal remains “high”. Evaluation subsequently follows for both channels within the measuring pause.

6.4 Flow Chart Channel 1 or Channel 2 alone, With Too Short Measuring Interval

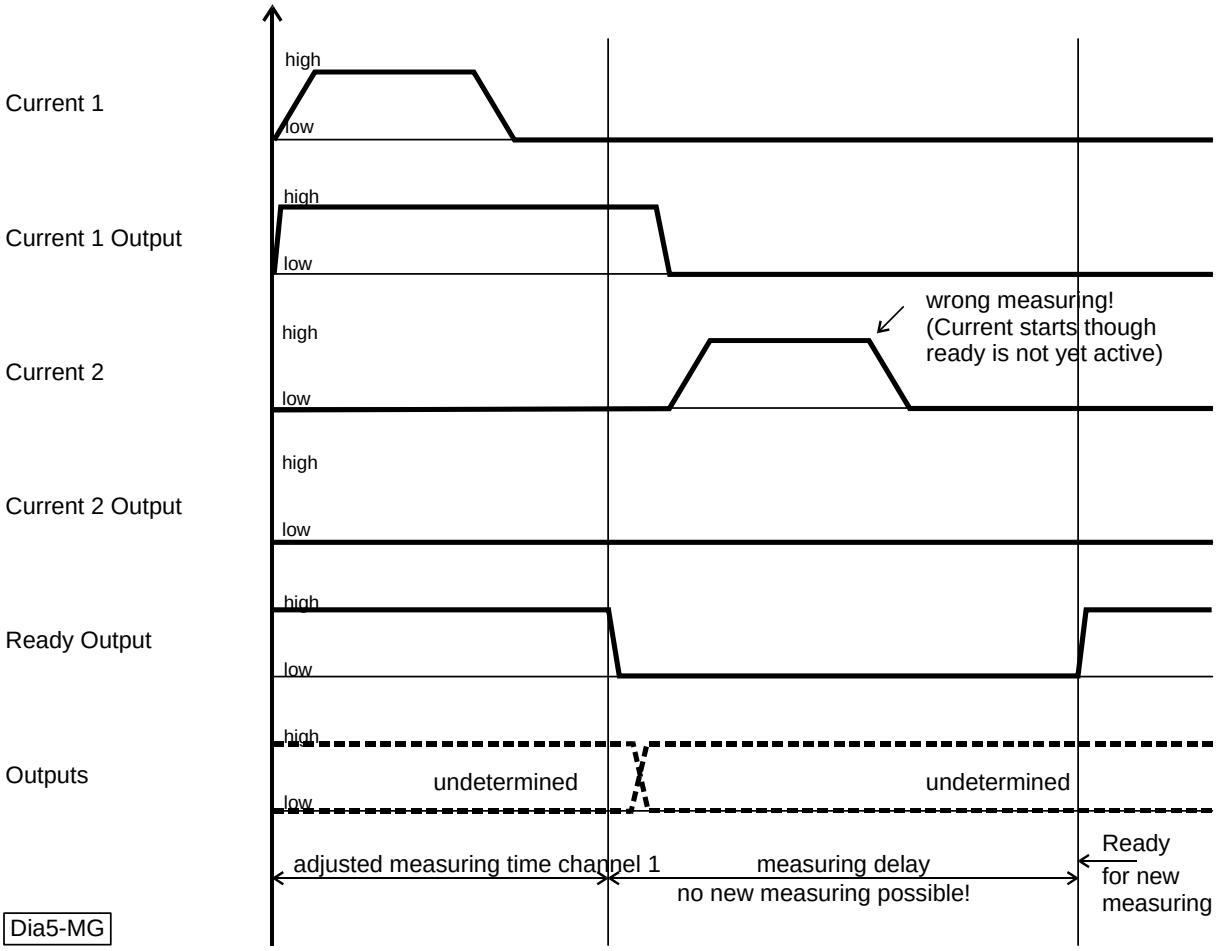


Dia4-MG3

Misadjusted flow!
Should a new flow cycle start within the measuring interval already, the outputs are undetermined and lead to wrong results.
Remedy:

- Adjust measuring time to current time.
- Shorten measuring interval by skipping evaluations.
- Extend cycle time.

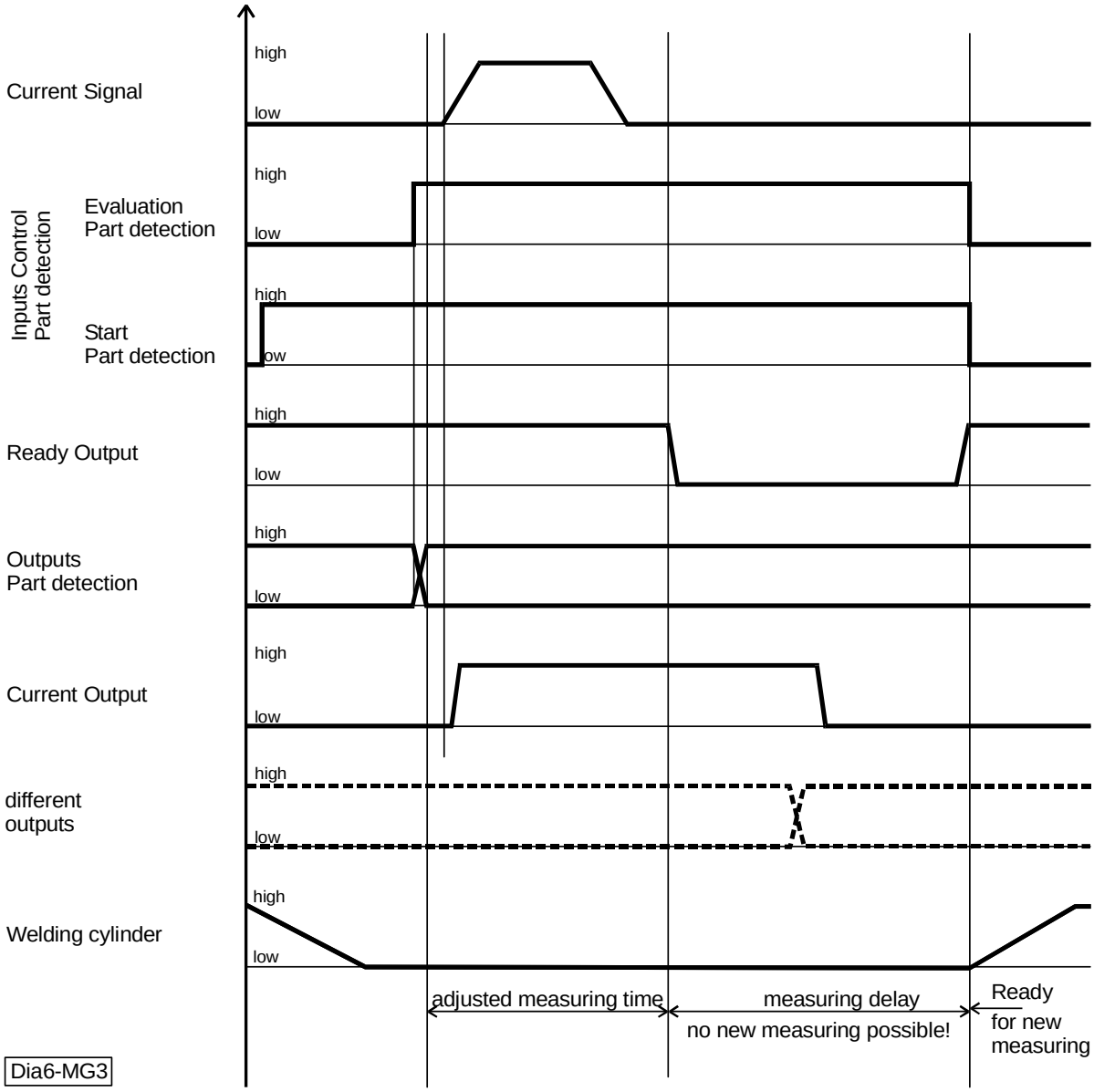
6.5 Flow Chart Channel 1 and Channel 2 with Parallel Measuring within the Evaluation Time of the Respective Channel that Measures First



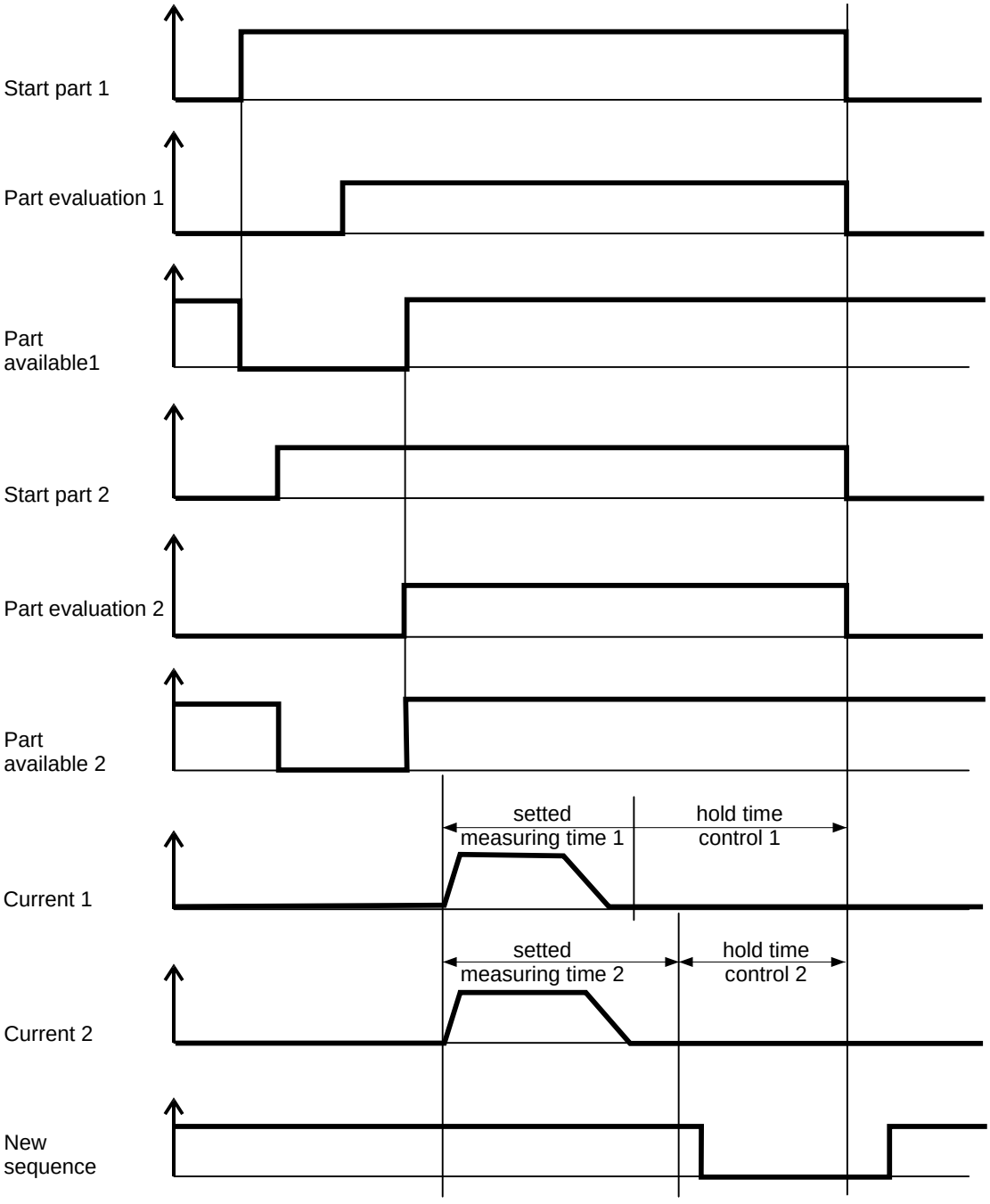
Misadjusted flow!
Second channel starts measuring without ready signal being “high”.
Remedy:

- Extend channel 1 measuring time such that it overlaps with the second measuring time.

6.6 Flow Chart Parts Detection and Current Measuring



6.7 Flow Chart Part Detection and Current Measuring Parallel

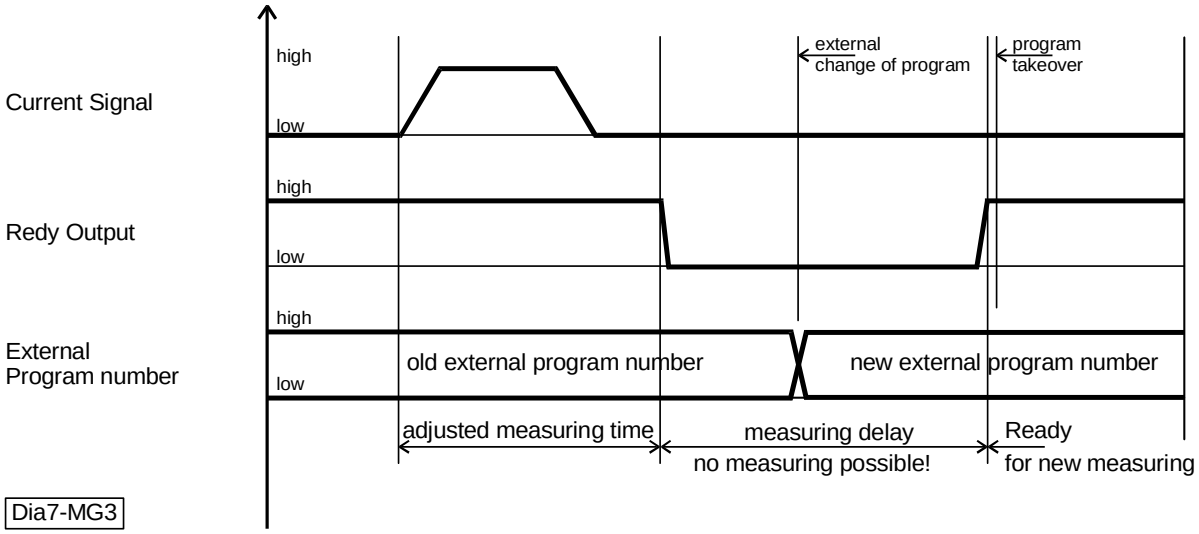


Dia7-MG3

The active measurement waits for the subsequent current of the next channel if the part detection signals are active and the current for the primary channel has ended (or the part detection signals are interrupted).
Upper example:

- Channel 1 commences
- Channel 1 is finished and waits on channel 2 because the part detection signal for channel 2 is still active.
- The channel sequence is irrelevant during this.

6.8 Flow Chart Measuring and External Selection



Dia7-MG3

Change of program best during measuring interval. Change can be made after current initiation earliest.

6.9 Connection to field bus system

The MG3 can communicate with a control or master computer via CAN-Bus. The CANopen log is utilized for this purpose. The MG3 acts as a CANopen slave. Detailed instructions can be found on our homepage

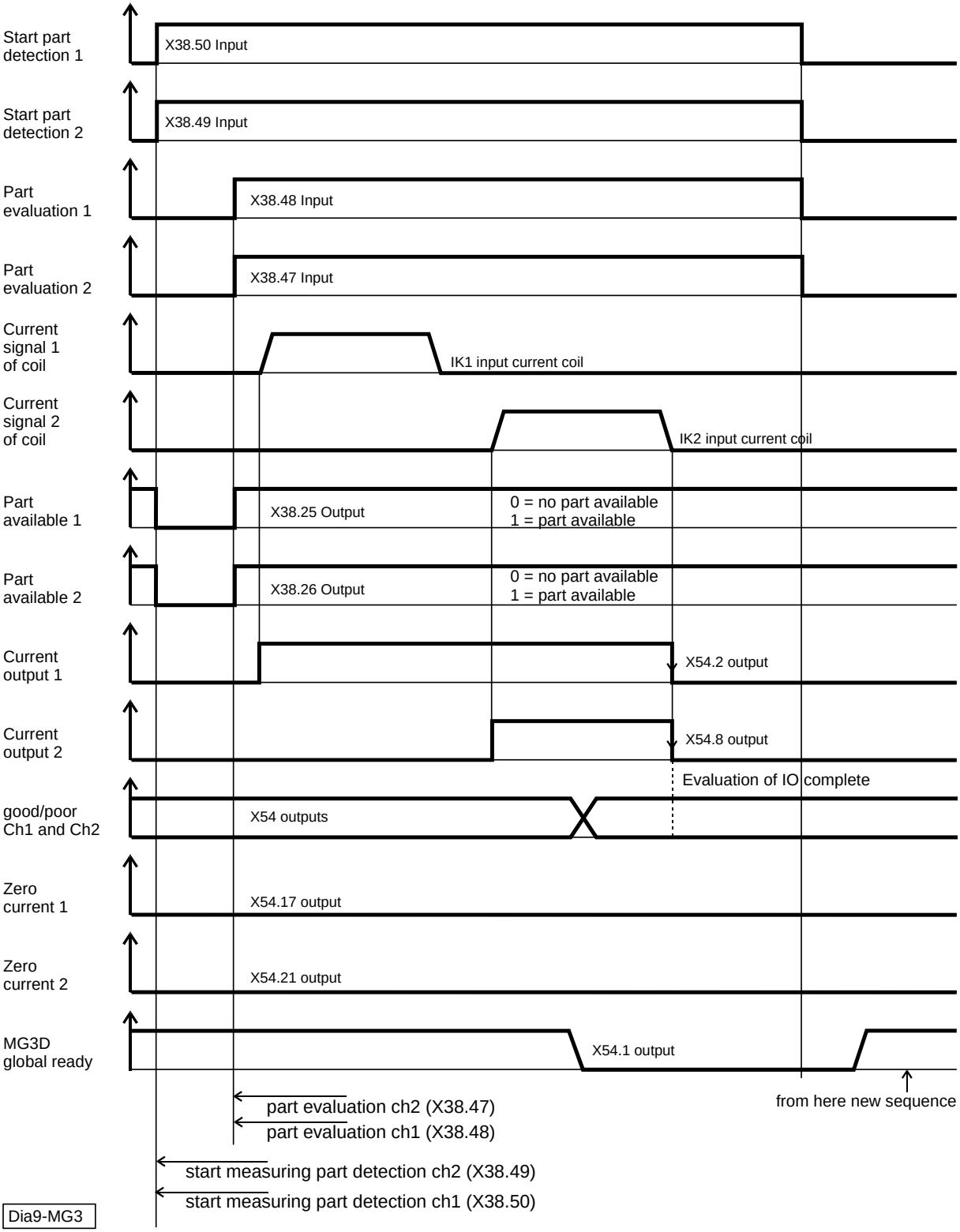
www.miyachieurope.com

under

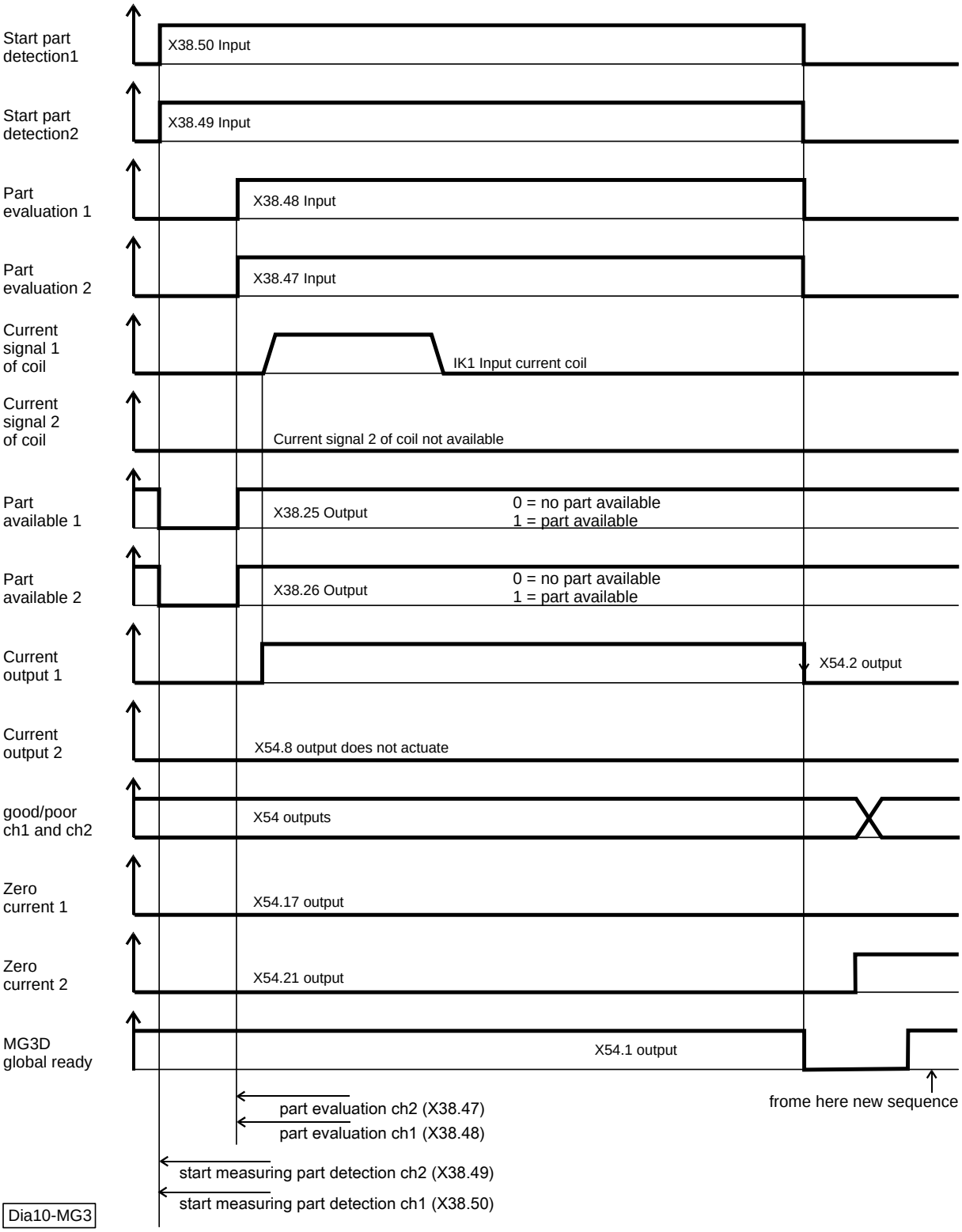
"Supplement to MG3 Digital operating instructions"

The associated Electronic Data Sheet (EDS) can also be downloaded here.

6.10 Flow Chart 2 channel part detection with current



6.10.1 Fault Example Flow Chart part detection with current



7 Appendix

7.1 Error messages

No.	Error	Cause
4001		
4002	Open file	CF or file damaged
4003	Save file	CF or file damaged
4004	Wrong file type or file faulty	xxx is wrong, or faulty file header
4005		
4006	Access to BAT RAM	Battery exhausted
4007	Load file	See 4002
4008	File already existing and write-protected	On overwriting write-protected file
4009		
4010		
4011		
4012		
4013		
4014		
4015		
4016		
4017		
4018		
4019		
4020	CAN: Timeout data read	Data transfer overloaded, possible causes: measuring interval too short too intensive rotary transducer Actuation during highly frequented measurements
4021	CAN: Timeout data write	Data transfer overloaded, possible causes: measuring interval too short too intensive rotary transducer Actuation during highly frequented measurements
4022	CAN: Timeout receive request	
4023	CAN: Timeout send request	
4024	CAN: Overflow job buffer	Bottleneck executing several tasks, possible cause: display of too many graphics during strongly frequented measurements
4025		
4026		
4027		
4028		
4029		

7.2 Accessories

7.2.1 MG3 Digital

Article number	Designation	Quantity
766.09 323	MG3 Digital – Basic - 2 Channel	
581021	Power cable	1
770.60 170	Voltage measuring cable	1
770.60 152	Toroidal coil 70 mm	1
770.60 178	Coil measuring cable 3 m	1
770.66 309	CompactFlash 128 MB	1
766.09 409	Operating Instructions MG3D	1

7.2.2 MG3 Digital – W1

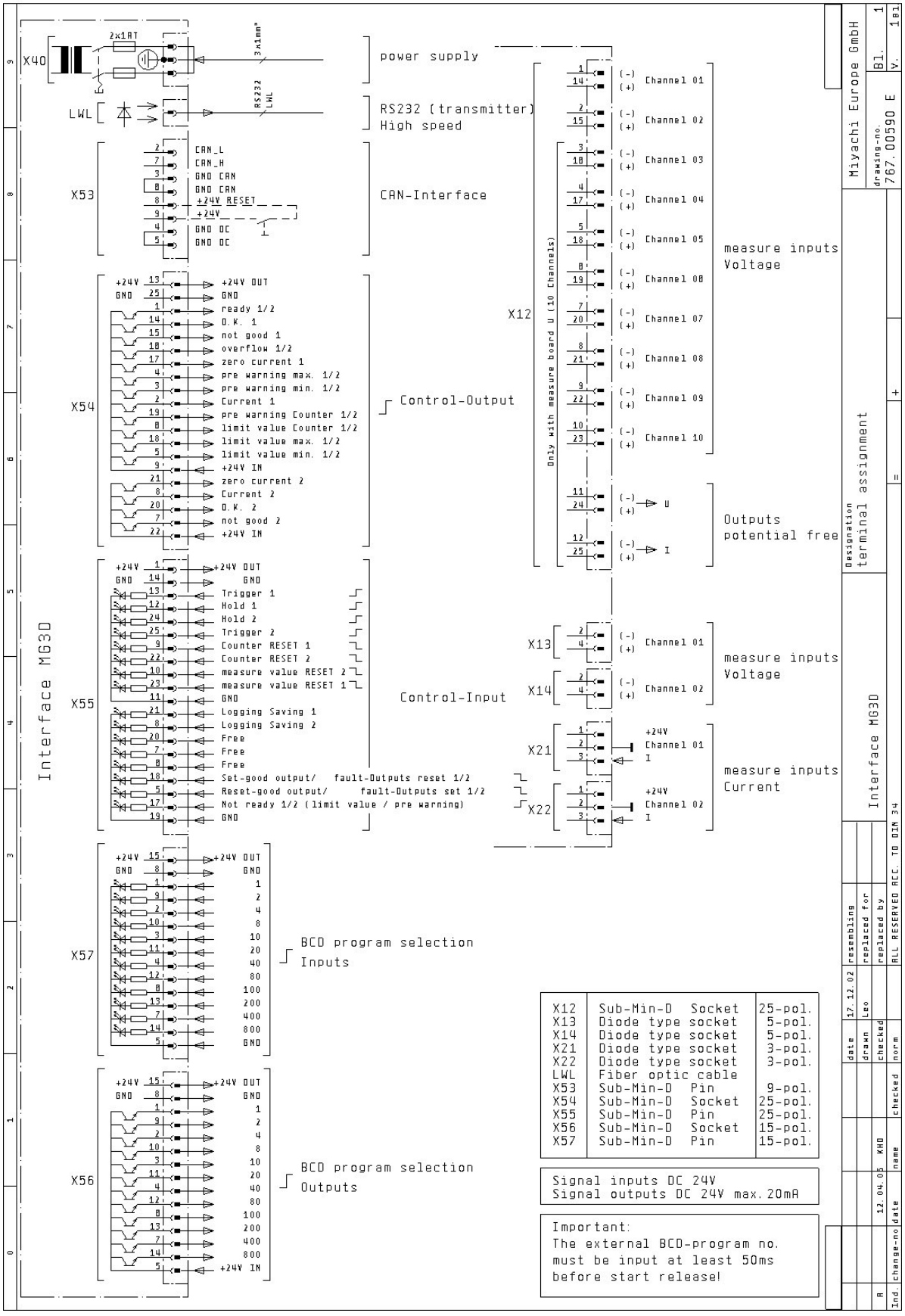
Article number	Designation	Quantity
866.00 500	MG3 Digital + 1 Channel Displacement	
581021	Power cable	1
770.60 170	Voltage measuring cable	1
770.60 152	Toroidal coil 70 mm	1
770.60 178	Coil measuring cable 3 m	1
770.66 309	CompactFlash 128 MB	1
766.09 409	Operating Instructions MG3D	1
770.66 186	Displacement sensor ST1278	1
766.09 162	Sensor cable 1 channel	1

7.2.3 MG3 Digital – W2

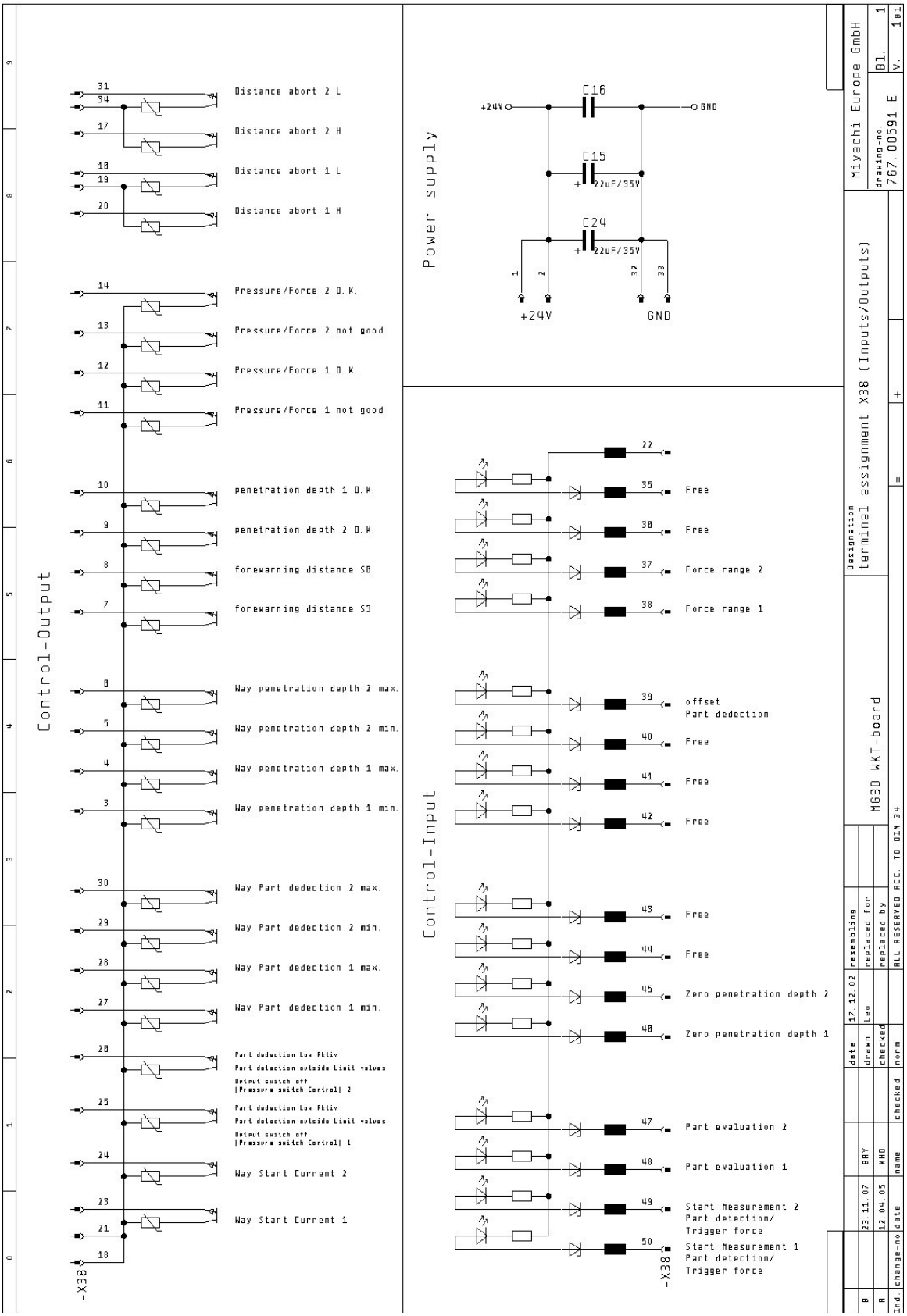
Article number	Designation	Quantity
866.00 501	MG3 Digital + 2 Channel Displacement	
581021	Power cable	1
770.60 170	Voltage measuring cable	2
770.60 152	Toroidal coil 70 mm	2
770.60 178	Coil measuring cable 3 m	2
770.66 309	CompactFlash 128 MB	1
766.09 409	Operating Instructions MG3D	1
770.66 186	Displacement sensor ST1278	2
766.09 163	Sensor cable 2 channel	2

7.3 Enclosures

7.3.1 Connection diagram, Interface MG3D, 767.00590 E



7.3.2 Connection diagram, X38 (Inputs / Outputs), 767.00 591 E



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