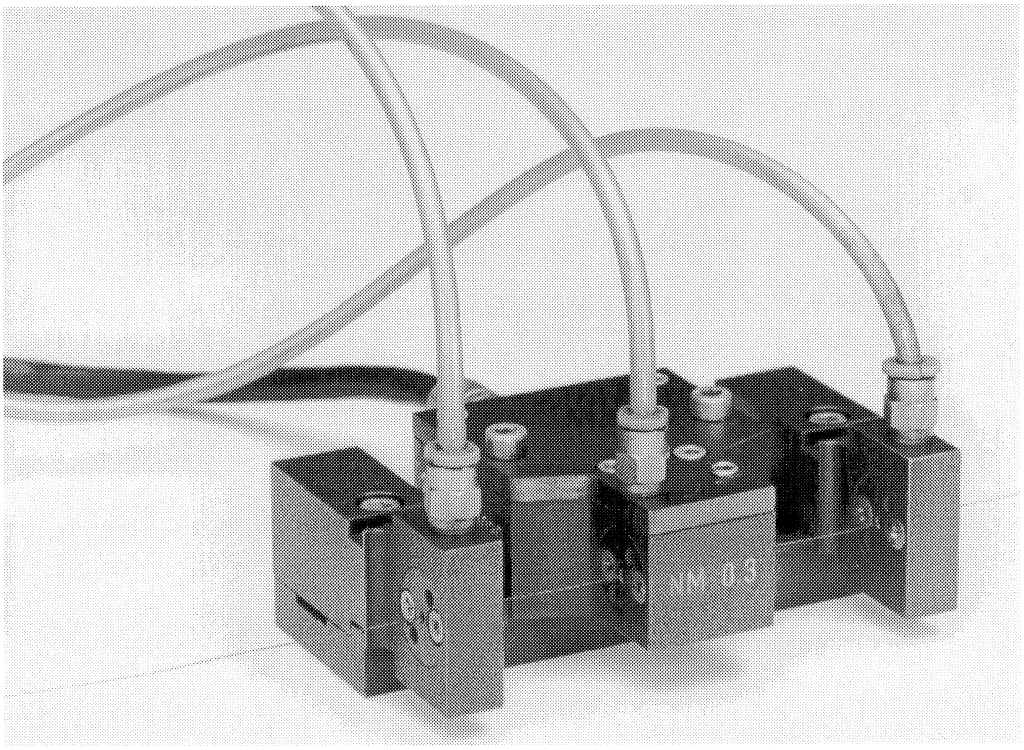
Transmitter system
FINE WIRE 2.864

Operating Instructions

FOERSTER



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Copyright

These operating instructions are intended for assembly, operating and monitoring personnel.

In Laisen 70, D-72766 Reutlingen

SAFETY

Symbols used

The following symbols are used in these Operating Instructions:

Danger!
This warns about danger to persons. Here you will find information or rules on what to do and what not to do in order to prevent injury to persons.

WARNING!
This warns of the possibility of damage to the test system. Here you will find information or rules on what to do and what not to do in order to prevent damage to property.

NOTE!
This gives tips on economical use of the testing system and other useful information.

Proper use (individual)

The Transmitter system FINE WIRE 2.864 must be used only for non-destructive testing of **wire** with diameter range 120 µm to 1600 µm!

The transmitter system must be operated only in combination with suitable coiling mechanism.

For reasons of safety, conversions and modifications to the transmitter system are prohibited.

Dangers and safety instructions

General

The Transmitter system FINE WIRE 2.864 was built in accordance with the state of the art and recognized safety rules. Improper operation or misuse poses a danger to

- life and limb of the operator or other persons,
- the machine and other property of the owner,
- efficient operation of the machine

All persons involved in setting up, commissioning, operating, maintaining and repairing the machine must

- be appropriately qualified
- follow these Operating Instructions exactly.

This is a matter of your own safety!

Machine-specific characteristics

The Transmitter system FINE WIRE 2.864 operates without rotating parts.

Fine wire are fed through the transmitter system at high speed. Touching the wire causes injuries.

Before handling the transmitter system switch off the coiling mechanism resp. drawing line.

Emissions

The transmitter system FINE WIRE 2.864 does not emit sound.

Operator stations

The operator station is located near the electronics cabinet or at the control panel of the Transmitter system FINE WIRE 2.864.

Observe the relevant safety and application hints when using solvents, e.g. acetone, to clean the transmitter system FINE WIRE 2.864 from graphite deposits.

Approved operators

Only authorized persons may work on the Transmitter system FINE WIRE 2.864 together with the superposed coiling mechanism.
Observe the legally stipulated minimum age!

The operator bears responsibility with regard to other persons in his or her working area.

Areas of responsibility must be clearly defined and observed for the different activities on the transmitter system.

Uncertain areas of responsibility represent a safety hazard!

The owner must
- make the Operating Instructions available to the operator and
- make sure that the operator has read and understood them.

Personal safety equipment

Personal safety equipment is not necessary.

Safety measures at the place of installation

The transmitter system FEINDRAHT 2.864 is integrated in a drawing machine or coiling mechanism which is not belonging to the extent of delivery.

REMARK!
Instructions concerning the drawing machine or the coiling mechanism are valid as well for the transmitter system.

Protective equipment

The transmitter system FEINDRAHT 2.864 has no implemented protective equipments.

Behavior in the event of an emergency

In the event of an emergency situation, **immediately** press the red EMERGENCY STOP switch.
Have the cause of the fault remedied by authorized personnel without delay.

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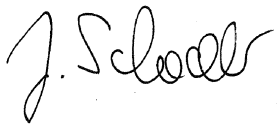
DECLARATION of CONFORMITY

We declare in our own responsibility, that this product complies with the requirements of following European Directives and corresponding standards:

- European Directive 89/336/EEC: Electromagnetic Compatibility
- European Standard EN 61326 - 1
- European Standard EN 61326/A 1

July 1, 2001

INSTITUT DR. FÖRSTER
Division Test Systems



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Stefan Flores

Mechanical construction

See block diagram UA 21 2.864.01 and dimension sheet UA 02 2.864.01

The FINE WIRE transmitter system consists of the following components:

- 1 basic plate, size-independent
- 1 or more FINE WIRE test coils, graded on the basis of nominal sizes.
  A specific wire diameter range can be tested per nominal size, see below
- 1 or 2 pairs of die holders. Each of the two possible pairs can be used for a specific nominal size range, see below
- 1 or more sets of guiding dies, each consisting of 4 ea., graded on the basis of nominal sizes. 2 ea. guiding dies are used for the test coil and
  1 ea. guiding die is used for the two die holders. The guiding dies in the test coil can be fitted there in the case of size changes since blocks and test coil are equally dependent on wire diameter
- 1 coil cable, size-independent

The die holders perform the function of advance guidance of the wire under test, so as to ensure that it is guided steadily within the test coil. If space is restricted the basic plate and the die holders can be dispensed if the external wire feed and discharge systems guarantee a steady wire pass.

Installation

The system is installed on a rewinding line or directly on the drawing line. The wire temperature may not exceed 100 °C at the test point.

> As little graphite as possible should adhere to the wire under test. Graphite deposits in the test coil may lead to tearing of the wire and destruction of the coil.

The system is mounted via 2 bores in the basic plate. The bolts are not included in the scope of delivery. The support surface should be an earthed metallic structure which is connected electrically to the test instrument's housing.

The entire transmitter system should be aligned as well as possible with the wire guide system upstream and downstream.

The coil cable should be laid so that its position is fixed, e.g. in a protective conduit or in a cable duct. It may not be laid next to other electrical cables.

The dimension sheet shows the throughput direction of the wire for the condition of the components as delivered ex-works. The following aspects are crucially important in this case:

- The two die holders must be fitted on the basic plate so that their centering disk is located at the entry end and so that the compressed air connection is made from the top. If the throughput direction is opposite to that shown in the dimension sheet, the stud bolt, Item 4, and the quick push-pull connector, Item 6, should be reversed on the two die holders.
- The compressed air connection on the test coil should also be from the top and must be located non-symmetrically at the entry end. In order to convert to the opposite throughput direction, swap the positions of the stud bolt, Item 4, on what is to be the entry end and the quick push-pull connector, Item 6.
- The guiding die to be fitted in each centering disk has a tunnel-shaped entry guide only at one side. The guiding dies must be fitted accordingly. It will then be possible to thread up the wire in throughput direction.

If the test coil and the two die holders are fitted in this way on the basic plate or if they have been converted in this way beforehand, the compressed air will blow the graphite adhering loosely to the entering wire away from the throughput direction.

The plastic hose supplied must be split in order to make the compressed air connection at the two die holders and the test coil. Join these 3 connections to form one single overall connection using the supplied X distributor. Connect this common supply line to a pressure reducing valve or using the supplied quick push-pull connector. The pressure reducing valve is not included in the scope of delivery.

The pressure reducing valve should be set to an outlet pressure of approx. 0.2 to 0.5 bar. An excessively high pressure will result in audible vibration (whistling) of the wire in the guides and must be avoided.

Size change

Assignment of the diameter of the wires under test to the nominal size of the test coil and of the guiding dies

- 120 - 200 µm → Nominal size 0.3 mm
- 180 - 270 µm → Nominal size 0.4 mm
- 250 - 400 µm → Nominal size 0.6 mm
- 350 - 700 µm → Nominal size 1.0 mm
- 600 - 1100 µm → Nominal size 1.5 mm
- 1000 - 1600 µm → Nominal size 2.0 mm

The two different die holders and related centering disks must be used for the nominal size ranges 0.3 to 1.0 mm and 1.5 to 2.0 mm.

Procedure

- Fit the test coil with the appropriate nominal size and screw it tight with the 2 screws, Item 2.
- Choose one of the die holder appropriate to the nominal size range.
- Fit the guiding dies of the appropriate nominal size into the centering disks on the two die holders. If the centering disk cannot be moved out of the recess in the die holder, the centering disk can be forced off using its securing screws if these are screwed into the threaded bores in the centering disk.
- Firmly screw the two die holders to the basic plate, using 1 screw, Item 3, in each case.

It is absolutely imperative that you prevent graphite penetrating the open contacts of the test coil or coil cable when exchanging the test coil.

Settings on the test instrument DEFECTOMAT CS 2.844 FINE WIRE

Supplement to instruction manual DEFECTOMAT CS 2.844
Specifically for tungsten and molybdenum wire

Effective width

on page CONFIGURATION → **PROBE SETTING**
1.6 mm for all FINE WIRE test coils

Test frequency

The test frequency is dependent only on the nominal size of the FINE WIRE test coil and the conductivity of the wire under test and is not dependent on its diameter:

- Nominal size 0.3 mm 9.5 MHz
- Nominal size 0.4 mm 9.5 MHz
- Nominal size 0.6 mm 4 MHz
- Nominal size 1.0 mm 2 MHz
- Nominal size 1.5 mm 1 MHz
- Nominal size 2.0 mm 1 MHz

In order to test wires with a conductivity higher than that of tungsten wire, the test frequency must be reduced inversely proportional to approx. 1/4 of the values specified above. It is not practical to increase the test frequency beyond the values specified above.

Evaluation

Y-magnitude
absolutely necessary on the absolute channel,

Y-magnitude
recommended for the differential channel.

Phase

The phase setting is important for Y-evaluation. If an adequately high test frequency is selected, this results in a phase angle capable of being evaluated in the impedance plane between the signals of a diameter variation on the one hand and the wanted defect, e.g. splits, on the other. First trigger zero compensation on a flawless wire section of approx. nominal diameter. Then adjust the phase so that the signal of a reduced-diameter point (which must be considered as a disturbance signal and which must thus be not evaluated) lies in the impedance plane in negative direction (9 o'clock direction). The signal of the defect will then be approximately in 10 o'clock direction, thus has a component in Y direction and is evaluated as flaw provided this Y component exceeds one of the thresholds A, B or C and provided a flaw class F1, F2 or F3 has been assigned to these thresholds (CONFIGURATION, Page EVALUATION SETTING).

For signals in X direction, no evaluation occurs even if their deflection exceeds the 100 % circle if none of theY-trigger thresholds A, B and C are exceeded.

These instructions are mandatory for the absolute channel. They also apply to the differential channel if diameter changes occur so abruptly that they are not adequately suppressed by the differential array and are not to be evaluated either. However, if diameter changes are so gradual that they are entirely suppressed by the differential array, there is no need for Y-evaluation on the differential channel. Phase-independent V-evaluation may be selected.

Y sensitivity

The phase angle between the signals of a reduced-diameter point and of a real defect (split), described for setting the phase, may apparently be increased by an additional Y sensitivity. It is advisable to set the Y sensitivity to 0 dB during phase setting.

Sensitivity on the absolute channel

The essential advantage of the absolute channel "Probe 1" (by comparison with the differential channel "Probe 2") is that the signal amplitudes are directly related, even if not related in linear manner, to the *absolute* split depth. Zero compensation must have been performed on a flawless wire section for this purpose. By contrast, the differential channel supplies signal amplitudes which are related to split depth *gradients*.

This advantage of the absolute channel is necessarily offset by a disadvantage: In addition to the absolute split depth, the conductivity of the wire under test also influences the signal height. Changes in conductivity owing to changing composition of the parent material or microstructure variations and as the result of temperature variations, referred to the condition at the instant of zero compensation, have exactly the same effect as regards phase angle in the impedance plane as do splits, i.e. they will initially reach the trigger threshold as of a specific magnitude of the change in Y direction. Since these changes are generally slow processes, their *gradients* are very slight and are hardly indicated or not indicated at all on the differential channel.

Sensitivity and trigger threshold A on the absolute channel are set so that the changes of the Y signal component resulting from fluctuations of the "conductivity" disturbance factor do not yet reach the trigger threshold but, on the other hand, splits as of the depth at which they have a negative influence on wire quality exceed this trigger threshold. This generally necessitates finding a compromise. The influence of the "conductivity" disturbance factor can be reduced with the "Auto Track" parameter (please refer to the relevant section).

The procedure below is recommended since the splits depth can be determined only after a destructive test using the micrograph method and this wire section is then unable to be used as the adjustment standard: The interrelationship between the signal amplitude for a specific diameter reduction and the Y signal component for various split depths can be determined in laboratory investigations for various diameters. If, for instance, we obtain a signal ratio of 10:1 between a diameter reduction of 20 % by comparison with the nominal value and the required minimum gap depth to be detected, the setting procedure is then as follows: Set the sensitivity so that a diameter reduction of 20% (which can be implemented easily by etching) achieves a signal deflection of just 100 % on the negative X axis and then set the trigger threshold A to 10 %.

Sensitivity on the differential channel

The sensitivity of the differential channel can be set higher than that of the absolute channel since the "conductivity variation" disturbance parameter is largely already suppressed by the differential array of the test coil. Consequently, the differential channel is suitable for detecting smaller shorter flaws and for indicating the surface roughness which is a criterion for further processing of the wire in following drawing stages.

Auto Track

The wire section in the test coil has a quite specific diameter and a specific conductivity at the instant at which zero compensation was triggered. A specific ambient temperature prevailed and, under certain circumstance, there may have been a specific accumulation of graphite in the throat of the test coil. This situation results in deviations during the course of testing, but these deviations still do not represent a quality impairment of the wire. Consequently the zero adjustment condition of the absolute channel should still apply. This is ensured by the Auto Track function provided it is activated.

Depending on the "Auto Track Speed" parameter, a deviation from the zero adjustment condition is eliminated again more or less quickly, provided it is less than the trigger threshold A. However, if a split occurs with a Y signal component greater than the trigger threshold A, the Auto Track function is discontinued for as long as trigger threshold A is exceeded.

Auto Track is, in principle, not necessary for the differential channel.

High-pass filter and low-pass filter

These are set automatically by the test instrument on the basis of the setting of **Expected Speed** and **Tolerance +/-** on Page CONFIGURATION → TEST CONTROL SETTING.

Evaluation

on Page CONFIGURATION → EVALUATION SETTING
This must necessarily be set to "Wire"

Section length

on Page CONFIGURATION → EVALUATION SETTING
Recommended setting: Expected wire length divided by 180; then round up to the next possible value up for the "Section Length".

Cropping lengths, Front / Tail

on Page CONFIGURATION → TEST CONTROL SETTING
If it is known that the wires under test have flaws at the tails so that a certain length is cut off ("cropped") after the test, splits in these sections should not unnecessarily worsen the test report. Flaws in these sections are excluded from the report by setting the two parameters.

Maintenance

The test coil throat must be kept free of graphite deposits. The test coil may **not** be placed in an ultrasonic bath for this purpose since the coil tube (carrier tube for the windings) would be damaged. Soften graphite deposits with a little acetone and then remove them with a section of wire.

guiding dies should be inspected occasionally for wear using a measuring microscope. The clear diameters are as follows when new:

- 2 µm smaller than the nominal size in the nominal size range 0.3 to 1.0 mm
- 5 µm smaller than the nominal size in the nominal size range 1.5 to 2.0 mm

The following approximate values apply as the permitted deviation from the nominal size:

- 50 µm in the nominal size range 0.3 to 0.6 mm
- 100 µm in the nominal size range 1.0 to 2.0 mm

Defective test coils can be repaired at INSTITUT DR. FÖRSTER. Please return defective test coils **without** guiding dies.

* Durchlaufrichtung kundenseitig änderbar
* TROUGHPUT DIRECTION CHANGEABLE BY COSTUMER

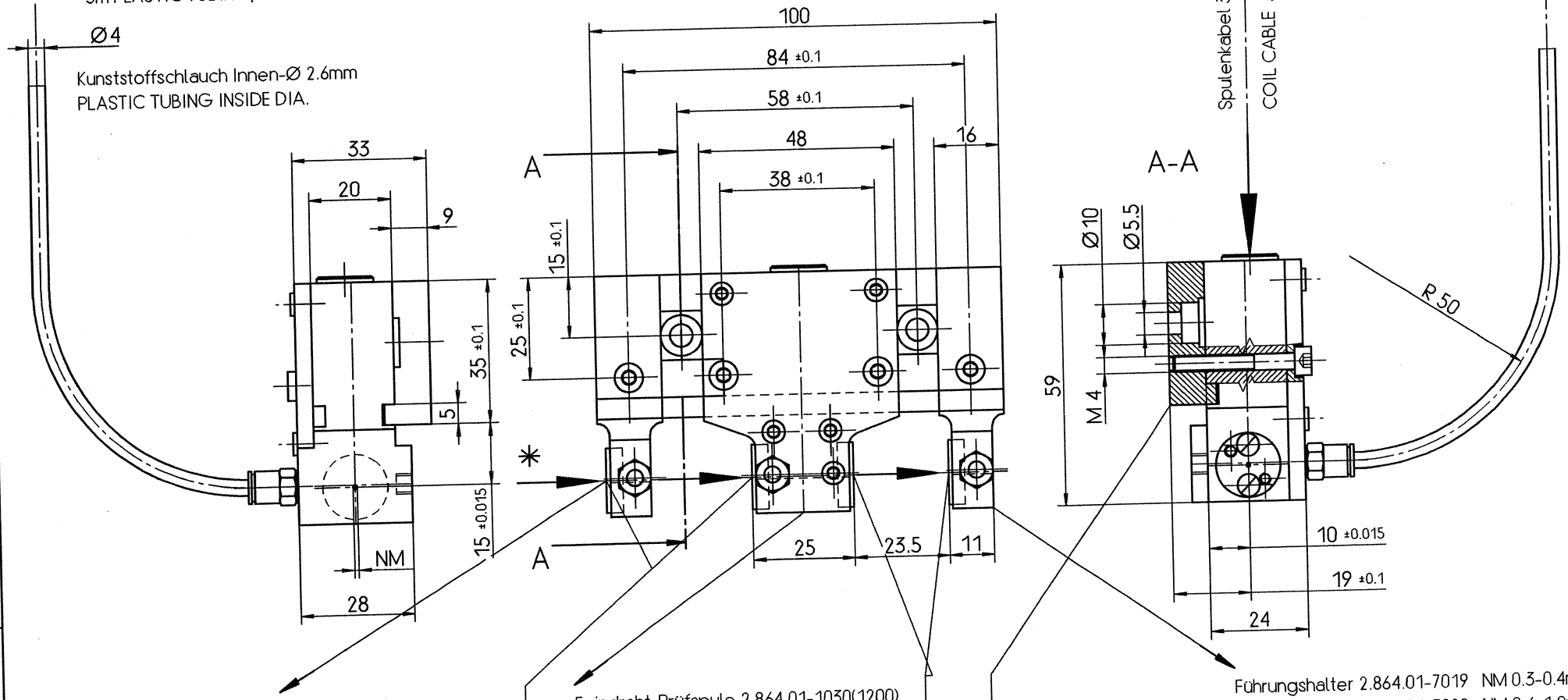
AIR PRESSURE

5m Kunststoffschlauch, 1x X-Verteiler, 1x Steckverschraubung in Grundplatte enthalten
5m PLASTIC TUBING, 1x X-DISTRIBUTOR, 1x PLUG CONNECTOR IN BASIC PLATE INCLUDED

Ø4

Kunststoffschlauch Innen-Ø 2.6mm
PLASTIC TUBING INSIDE DIA.

Spulenkabel 3m 2.864.01-9001
COIL CABLE 3m 2.864.01-9001



Führungshalter 2.864.01-7019 NM 0.3-0.4mm
Führungshalter 2.864.01-7020 NM 0.6-1.0mm
Führungshalter 2.864.01-7021 NM 1.5-2.0mm
DIE HOLDER

Feindraht-Prüfspule 2.864.01-1030(1200)
Nennmass NM 0.3-2.0mm
FINE WIRE TEST COIL 2.864.01-1030(1200)
NOMINAL DIAMETER 0.3-2.0mm

4xFührungsstein 2.864.01-2030(2200)
Nennmass NM 0.3-2.0mmm
4xGUIDING DIE 2.864.01-2030(2200)
NOMINAL DIAMETER 0.3-2.0mm

Grundplatte 2.864.01-7001
BASIC PLATE

Führungshalter 2.864.01-7019 NM 0.3-0.4mm
Führungshalter 2.864.01-7020 NM 0.6-1.0mm
Führungshalter 2.864.01-7021 NM 1.5-2.0mm
DIE HOLDER

Schutzvermerk DIN 34

SML	Ref.	Blatt 1v1	Scale 1:1	Format DIN A3	Micro
File	Bezeichnung 1 /Designation	Mod.	Date	Name	Adr.
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	Bezeichnung 2 /Designation 2				
Sach-Nr./Subject-No	TRANSMITTER SYSTEM FINE WIRE				
	Teile-Nr. /Parts-No.				
Date	2.864.01	b 980108	08.01.98	Le	
	UA Sach-Nr. /Subject-No.	a Freigabe	18.09.95	Le	FOERSTER
18.09.95 Le	04 148 271 8				

* Durchlaufrichtung kundenseitig änderbar
* TROUGHPUT DIRECTION CHANGEABLE BY COSTUMER

AIR PRESSURE

5m Kunststoffschlauch, 1x X-Verteiler, 1x Steckverschraubung in Grundplatte enthalten
5m PLASTIC TUBING, 1x X-DISTRIBUTOR, 1x PLUG CONNECTOR IN BASIC PLATE INCLUDED

Kunststoffschlauch
007 062 9
PLASTIC TUBING (7)

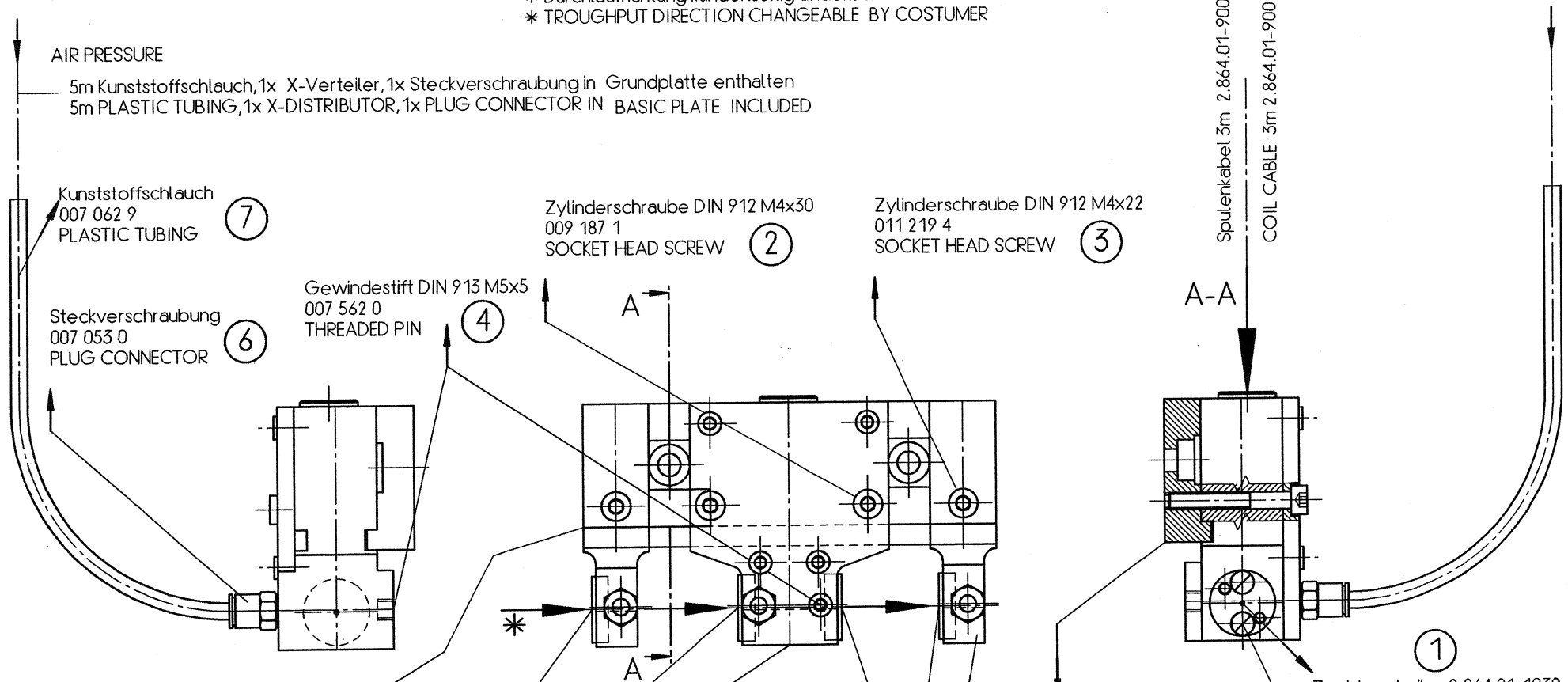
Steckverschraubung
007 053 0
PLUG CONNECTOR (6)

Gewindestift DIN 913 M5x5
007 562 0
THREADED PIN (4)

Zylinderschraube DIN 912 M4x30
009 187 1
SOCKET HEAD SCREW (2)

Zylinderschraube DIN 912 M4x22
011 219 4
SOCKET HEAD SCREW (3)

Spulenkabel 3m 2.864.01-9001
COIL CABLE 3m 2.864.01-9001



(1)
Zentrierscheibe 2.864.01-1030-0003
Zentrierscheibe 2.864.01-1060-0003
Zentrierscheibe 2.864.01-1150-0003
CENTERING PLATE

Grundplatte 2.864.01-7001
BASIC PLATE

Führungshalter 2.864.01-7019 NM 0.3-0.4mm
Führungshalter 2.864.01-7020 NM 0.6-1.0mm
Führungshalter 2.864.01-7021 NM 1.5-2.0mm
DIE HOLDER

Feindraht-Prüfspule 2.864.01-1030(1200)
Nennmass NM 0.3-2.0mm
FINE WIRE TEST COIL 2.864.01-1030(1200)
NOMINAL DIAMETER 0.3-2.0mm

Führungshalter 2.864.01-7019 NM 0.3-0.4mm
Führungshalter 2.864.01-7020 NM 0.6-1.0mm
Führungshalter 2.864.01-7021 NM 1.5-2.0mm
DIE HOLDER

Senkschraube DIN 965 M3x8
008 776 9
COUNTERSUNK SCREW (5)

4xFührungsstein 2.864.01-2030(2200)
Nennmass NM 0.3-2.0mmm
4xGUIDING DIE 2.864.01-2030(2200)
NOMINAL DIAMETER 0.3-2.0mm

SML	Ref.		Blatt	Scale	Format	Micro
			1v1	1:1	DIN A3	
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Werkstoff/Material	Bezeichnung 2 /Designation 2	f				
	TRANSMITTER SYSTEM FINE WIRE	e				
Sach-Nr./Subject-No	Teile-Nr. /Parte-No.	d				
	2.864.01	c				
Date	UA Sach-Nr. /Subject-No.	b	980108	08.01.98	Le	
04.12.95 Ho 21	148 271 8	a	Freigabe	04.12.95	Le	FOERSTER

Schutzvermerk DIN 34

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